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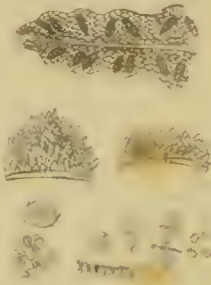


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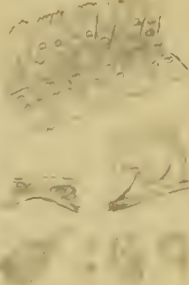
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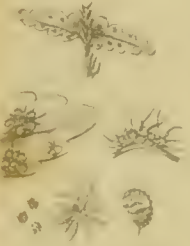
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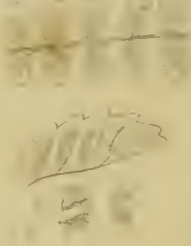
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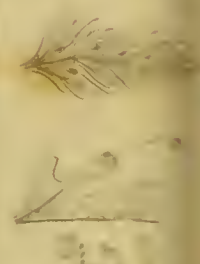
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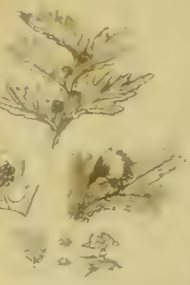
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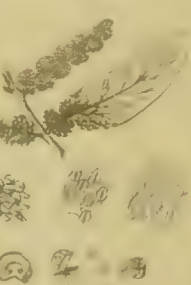
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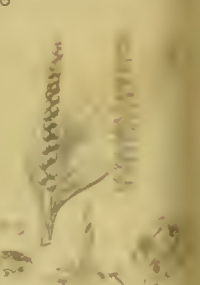
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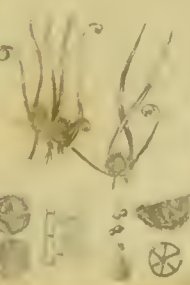
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AN  
ANALYSIS  
OF THE  
BRITISH FERNS  
AND  
THEIR ALLIES.

WITH COPPER-PLATE ENGRAVINGS

OF EVERY  
*SPECIES AND VARIETY.*

BY  
GEORGE W. FRANCIS. *K*

London:

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1837.

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TO

SIR WILLIAM JACKSON HOOKER, LL.D., F.R., A. & L.S.

&c. &c. &c.

AND

REGIUS PROFESSOR OF BOTANY IN THE UNIVERSITY OF GLASGOW

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SIR,

*To you, who stand so far before all other Writers in a practical knowledge of British Botany, and who have made the Ferns so particularly the subject of your attention, I beg respectfully to dedicate this little Work. I am aware that it is too small to be worthy of your attention; but I am anxious to take as early an opportunity as possible of offering my homage to those brilliant talents which have contributed so essentially to diffuse a love of Botany; that energy without which even talents are unavailing, and that urbanity of manners and liberality of feeling for which Botanists have always been celebrated.*

*That you may long be spared the full enjoyment of all your mental and physical faculties, to cheer your Friends and to instruct the World, is the ardent wish of*

Sir,

Your most obedient Servant,

THE AUTHOR.



## P R E F A C E .

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“I acknowledge no authority but that of observation.”—LINN

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This motto was my governing principle in writing the following work on the British Ferns and their allies, and in adopting it I hope that I shall neither be accused of arrogance, neglect of the opinion of others, nor yet of unnecessarily varying the details of science. Should the reader ask why I write at all; I answer, because the only book ever published upon this subject (Bolton's *Filices Britannicæ*) has long been out of print, and so much difference of opinion exists as to the identity of some species, and the arrangement of others, that I thought a plain and practical synopsis like the present would be useful to the tyro at least, if not to the practical Botanist.

The materials from which it has been compiled are these: I inspected all the Herbaria to which I had access, gathered wild and cultivated fronds wherever I could procure them, and wrote to most of our first-rate Botanists for specimens, remarks, and habitats: all these being collected, arranged, and studied, they were described and engraved without reference to any series of plates or descriptions whatever. I then collated these with the works of Linnæus, Willdenow, Sprengel, Swartz, Pursh, Withering, Smith, Hooker, Lightfoot, Hudson, &c. &c., and wherever there was a difference between myself and others, I searched again for the truth; and if still in doubt, have been careful to record the disparity.

The long introductory matter explains all that is known of the internal structure not only of the indigenous species, but of foreign also, and as it tends to induce in the mind a philosophical knowledge of the plants afterwards detailed, I flatter myself that the part devoted to this will not be the least valuable to the student of nature.

The manner in which the object has been accomplished, it is necessary to explain more in detail; and first, as to the illustrative

plates. They are small, for the sake of economy, and are intended chiefly to indicate the habit of the plants, while the magnified parts show their detail. They might have been finer as works of art; but, had they been executed by an engraver, minute as they are, they would perhaps have been less botanically accurate, as the smallest variation in many of them would materially have altered their character; and therefore, although a first and an untutored attempt at etching, I have preferred executing them myself, especially as by so doing I should save a large expence, perhaps not to be refunded by the sale of the work. The plate of Genera is a new feature in illustration, and it is hoped a useful one.

In the record and detail of species, the following order is observed:—First, the Latin and English name, and reference to figure; secondly, those essential characters which alone are necessary for discriminating the species, and which alone the true botanist will find it convenient to consult. The Synonymes and references to figures in other works which follow, give a history of the plant, and enable the student to refer elsewhere if in doubt. The Description may be considered collateral evidence, while the remaining parts will show him the varieties to which his plant is subject, the cause of them, its particular and general distribution, and the peculiarities attached to it.

In the part of the work which treats of the Genera, the reader will find, first, the derivation of the Genus, and a concise account of its general characteristics, and under it the arrangement of the species, according to their obvious distinctions.

In the Essential Characters of the different species, as few words as possible have been used, and those few pure and scientific. In The Synonymes, which go back to the time of Linnæus (or in some few instances a little before), the names of authors only are given, unless they have called a plant by different names in different of their works, when the works themselves are also specified. In the descriptive part, and discriminating remarks which follow it, pure scientific detail has not been so much aimed at as obvious differences and popular observations. The habitats have been collected from every authentic source which was attainable by me: a vast number will be found which have not been recorded before, and those few which are contained in previous publications, have most of them been lately authenticated.

Information of this varied and local kind cannot, of course, be expected from any one's unassisted labours: I have therefore had recourse in the latter part to the assistance of friends, and I cannot

speak too highly of the kindness and warmth with which my advances have been received, and without which indeed very much interesting matter must of necessity have been omitted. I hope that I have acknowledged in every instance the remarks thus received. My obligations are particularly due to H. C. Watson, Esq., who very kindly left out of his new Botanist's Guide any account of the Ferns, on purpose that I might benefit by his checked lists; also for the valuable remarks of Mr. W. Wilson, Mr. W. Leighton, Dr. Murray, Mr. W. Pamplin, Mr. Beevis, Mr. Castles, and Rev. W. Bree.

And now, kind reader, I leave the work in your hands, concluding with the words of Linnæus to Haller:—"If you have remarked errors in me, your superior wisdom must pardon them. Who errs not while perambulating the domains of nature? Who can observe every thing with accuracy? Correct me as a friend, and I as a friend will requite the kindness."

G. FRANCIS.

55, *Great Prescott Street*,  
*March 1st, 1837.*



## INTRODUCTION.

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A FERN is a flowerless plant which has a fibrous root, vascular stem, veined leaves, reticulated cuticle furnished with stomata, and bears spores as fruit in capsular receptacles.

The Ferns and their Allies form the first order of the Linnæan Class Cryptogamia, and the structure of them shows so exactly an intermediate character between the Vasculares and Cellulares that all systems of classification have assigned them this station among vegetables. They are without flowers, have but imperfectly formed vessels, and no deposition of real woody fibre, therefore cannot with propriety be arranged with Phænogamous Plants, while their semivascular texture and their fully developed leaves show their organization to be greatly above that of any other order of Cryptogamic plants.

Although the True Ferns have a direct analogy with the Palmæ and Cycadeæ, the connexion between them and other orders is more apparent in the Pteroides or Fern Allies, particularly the Equiseta and Lycopodia. The former of these two are nearly connected with several orders of Flowering Plants. In their hollow-jointed, silicious stem they resemble the Grasses, in other respects the Coniferæ and Amentaceæ, approaching the one by means of the genus Casuarina, and the other by that of Ephedra, nor are they far removed in structure from the Charas, thus connecting also the Ferns and the Algæ. The other of the Fern allies, the Lycopodia, were considered by the earlier Botanists as Mosses, so slightly do they differ from that tribe, not only in habit, but in many important characteristics.

Thus the tribes under consideration, which are divided according to the modern system into FILICALES, LYCOPODALES, and EQUISETALES, the first the True Ferns, the others the Pteroids or Fern Allies, altogether form valuable, because well-connecting links in the great chain of nature.



The scientific division of the Ferns into Tribes and Orders was long a desideratum in Botany. The earlier schemes are too vague for present use. That of Willdenow is still much used; in this he depended upon external characters alone, and divided the whole Ferns as follows.

1. GONOPTERIDES, which includes only the Genus Equisetum.
2. STACHYOPTERIDES, including Lycopodium, Botrychium, and Ophioglossum.
3. SCHISMATOPTERIDES, containing only Osmunda.
4. FILICES, which comprises all the Dorsal and Marginal Ferns.
5. HYDROPTERIDES (Water Ferns), containing Isoetes and Pilularia.

Valuable as the system of Willdenow was compared to all previously adopted, it is very far inferior to that of Sir J. E. Smith, improved as it has been by Mr. R. Brown, Mr. Kanlfuss, and others. Here, not only the external character of the fructification, but the structure of the fruit itself, and of its envelops, is considered of importance as a guide to essential characters; while the shape, division, and habit of the plant are used only in the discrimination of species: and thus classifying the Ferns as much as possible by the same laws as those which govern higher orders of vegetation.

#### FILICALES.

*ANNULATÆ, which have their capsules or thecæ ringed.*

Thecæ in clusters at the back of the frond, bursting irregularly and transversely. Ring vertical, or a continuation of the footstalk of the theca. Stems solid, their vernation circinate ..... } POLYPODIACEÆ.

Thecæ in two valved receptacles on the margin of a frond, bursting irregularly and vertically. Ring oblique. Vernation circinate. Stems solid ..... } HYMENOPHYLLACEÆ.

*EXANNULATÆ, which are without a ring to their capsules.*

Thecæ in clusters, terminating a leafy frond, bursting at a longitudinal suture, two valved, transparent, petioled, striated. Vernation circinate. Stems solid. } OSMUNDACEÆ.

Thecæ in spikes or racemes attached to a leafy frond, bursting at a transverse suture, two valved, opaque, sessile, smooth. Vernation straight. Stems hollow .. } OPHIOGLOSSACEÆ.

#### LYCOPODALES.

Thecæ of two kinds, indehiscient, inclosed within the base of radical leaves. Leaves hollow and filiform. Stem none. Vernation straight. (*Water Plants*). .. } ISOETACEÆ.

Thecæ of one kind, coriaceous, scaly, seated near the base of radical leaves. Leaves hollow and filiform. Stem long and creeping. Vernation circinate. .... } MARSILEACEÆ.

Thecæ of two kinds, axillary in a leafy spike or stem, two to four valved, sessile, free, dehiscient at a regular fissure. Stem solid, leafy, creeping or upright } LYCOPODIACEÆ.

#### EQUISETALES.

Thecæ in terminal conical catkins, bursting inwardly at a longitudinal fissure. Spores attached to four filaments. Stems leafless, striated, hollow, jointed. } EQUISETACEÆ.



## POLYPODIACEÆ.

(Including *Grammitis*, *Polypodium*, *Woodsia*, *Cistopteris*, *Aspidium*, *Asplenium*, *Scolopendrium*, *Blechnum*, *Pteris*, *Cryptogramma*, *Adiantum*.)

POLYPODIACEÆ, *Br.*, *D.C.*, *Kaulf.*, *Hook.*, *Grev.*, *Mack.*, &c.;—FILICES VERÆ, *Willd.*, *Linn.*, *Schreb.*, *Juss.*;—FILICES ANNULATÆ, *Hoffm.*;—FILICES GYRATÆ, *Web.*, *Mohr.*, *Sw.*;—FILICES DORSIFERÆ, *Smith*;—FILICALES, *Lindl.*;—PTERIDALES, FILICALES PHYLLOPTERIDES, EPIPHYLLOSPERMÆ, &c. &c.

STRUCTURE.\*—A FERN consists of root, frond, and fructification: under the first term is included the rhizomas or subterranean stems, while the frond comprises every part above the ground except the fruit and its appendages, and is subdivided into rachis or stem,† and pinnæ or leaves, which latter are more or less branched, lobed, or indented.

THE ROOT of all is perennial, fibrous, and sometimes creeping. The fibres are stout, generally hairy or scaly, and in many instances furnished at the extremity with hoods or sheaths, the use of which is not very obvious. Modern botanists agree with Sprengel in believing them the organs of absorption, as the hoods of the Lemnæ and some other of our water plants. Roth maintained that they were mere defensive organs, intended to prevent the introduction of the grosser fluids, and to shield the extremity of the fibre from injury. In many cases the fibres issue from a crown and form a tufted root, in other instances from thick stems, which in the British species creep under ground. These Rhizomas or creeping stems are furnished with buds irregularly disposed upon their surface, the uppermost ones yielding fronds, while those below produce as invariably radical fibres.

THE RACHIS is sometimes smooth, at others scaly or hairy, sometimes wholly clothed with leaf like expansions, at others void of them at the lower part. When cut transversely, it is seen to consist first of a cuticle, then we find a green bark, and the space within this is filled with cellular tissue. Through the tissue run longitudinally accumulated vessels, most of which are true spirals, not, however, formed of a cylindrical thread coiled up as in more perfect plants, but rather of a flat band, like a riband rolled spirally on a cylinder.

\* In illustration of the structure of all the tribes, the reader is referred to the Plate of Genera and its explanation. The Stomata afterwards spoken of may very easily be seen in any under part of the cuticle, merely by tearing it off and submitting it to the microscope. The arrangement of the vessels in the stem are apparent to the unassisted eye in any transverse section of it, and to view the spiral vessels it is only necessary to take two pins, and having thrust them through one of the bundles of vessels, separate them a little from each other, and in the cleft thus made the spirals will appear distinct when CONSIDERABLY magnified.

† In the progress of the work it has not been thought necessary to make a difference between the Rachis and Stipes, nor to divide the part under ground into Root and Rhizoma, the first term of each being sufficient.

Mixed with these vessels, which are real tracheæ, are tubular perforated ducts. The whole thus compounded of the two sorts, is sometimes collected into a close bundle, but more generally into a cylindrical sinuous ring, either hollow or filled with cellular tissue, and surrounded with a dark membrane. The number of these fascicles bears considerable relation to the size of the frond; thus in *Pteris aquilina* there are eight or ten, in *Aspidium aculeatum* five, in *Polypodium vulgare* three, while in the minuter species there is but one, which then occupies the centre of the rachis. When several bundles are present, no general rule can be given for their position (though constant in the same species), so varied are they in shape, size, and distance from each other. It is thought that the depression so often visible on one side of the rachis is occasioned by the absence of vessels on that part.

The cellular substance appears to have no tendency to arrange itself in strata, nor do the vessels increase in number as the plant increases in age. The stems, therefore, contain no real wood, the nearest approach to it being the hardened cuticle and the ducts themselves; they increase very little in diameter, but grow longitudinally throughout their whole length.

THE FROND is in its leafy part thin, veiny, and green. The veins do not extend longitudinally through the leaf in any species, as in the Monocotyledones, but diverge in a branched form (dichotomously divided) from the base of the leaf, or from the midrib, differing, however, from those in dicotyledonous plants in not containing woody fibre, and being uniform in size throughout all their ramifications. The divisions of the frond are for the most part constant in the same species, but varied in their size and number by external circumstances, the primary causes of which are superabundance or deficiency of nutriment, while temporary heat or moisture, exposure, shelter, or season of the year, occasion other but less striking irregularities. (*See Cistopteris fragilis.*) The Ferns are several years before they come to maturity, until which their essential characters are not always obvious. Thus young plants *Aspidium Filix-mas* very much resemble *Woodsia ilvensis*; they are first pinnatifid, then pinnate, afterwards when perfect nearly doubly pinnate. Also when a Fern has its barren fronds different from those which are fertile, the latter are more contracted, as if the sap which expanded the leaves of the one was employed in nourishing the fruit of the other.

THE VERNATION.—The circinate vernation, or curling up of the unexpanded frond, which prevails in all the dorsal Ferns, is almost peculiar to this tribe and one of their allies, being found in only two other orders, namely, the Palmæ and Cycadææ. If the frond be simple, so is the vernation, resembling a flat spiral spring, but when the frond is subdivided the vernation becomes equally compound, the larger divisions first opening, and by degrees the branches, pinnae and lobes.

THE SCALES so visible upon some species have been thought merely an excrecent growth caused by superabundant sap exuding from the surcharged pores. Sprengel supposed that they were part of the epidermis itself, lacerated by the pressure of the juices beneath. Perhaps both of these opinions are correct, a part of the epidermis of the frond being first detached, and afterwards nourished in the same manner as animal hair, and although void of life yet increasing from the base.

THE CUTICLE of the leafy portion of the frond presents a reticulated appearance, the meshes having wavy sides, and is furnished on the under surface with respiratory stomata, similar in form and function to those of Flowering Plants. The number of these on a given space is in a great degree accordant with the rapidity of the frond's withering when gathered. They are very abundant in *Aspidium filix-fœmina*, *Aspidium dilatatum*, and *Polypodium Dryopteris*. Thus is explained the reason for the drooping habit of this last and some other species. Be it observed, however, that in *Grammitis Ceterach* and *Aspidium lobatum* they are still more numerous, yet these latter plants do not wither so soon, a circumstance that may easily be accounted for from the frond being more entire in one, and thicker in both, the deprivation of an equal quantity of water not producing so great an effect.

THE REPRODUCTION of Ferns is a subject involved in much obscurity. Hedwig, Bernhardt, and others have proposed theories to explain this intricate matter, but without success. That the Ferns have no visible flowers is evident, but that they have some apparatus analogous to stamens and anthers, is maintained by most of our first Botanists. This opinion has apparently been adopted merely to get rid of the doctrine of spontaneous impregnation, which, however unsatisfactory, must not wholly be discarded until something more plausible be substituted. At present nothing whatever has been discovered of the origin of the germinating principle in any of the Cryptogamic orders; nor the laws which regulate the formation and development of their spores. As regards our present tribe, so keen has been the search, that every part of the plant has been subjected to the minutest investigation: not only the thecæ, their ring, and their cover, but the spiral vessels of the rachis, the stomata upon their cuticle, and the glands which are sometimes found attending upon them.

SEEDS OR SPORES.—The small, round, rough grains contained in the thecæ, considered formerly as geminæ or buds, are now known as seeds, but differing from common seeds in many respects. They have no cotyledons, but are a mass of cellular substance. Instead of sending upwards a plumule, and downwards a radical, from fixed points, they grow indifferently from any part of their surface, that most exposed to light shooting into the future frond, while the deeper point propels the root. Owing to these differences the seeds have been called, not only here but in all the tribes of Cryptogamic vegetables, spores



(or sporules) rather than seeds. They retain their vitality for many years, and those brushed from the dried plants of an herbarium will grow long after the specimens have been gathered, coming up first with a small crown or bud, from which soon issues a single leaf, or imperfect frond not differing in texture from the future growth, though as before stated much less ramified.

**THECÆ.**—The spores in all the species are contained in capsules or thecæ, each of which opens at a transverse irregular fissure, and is furnished with a jointed spring, nearly surrounding it, and by the elasticity of which the capsule is torn open and the spores dispersed.

**SORI.**—The thecæ are collected into linear, oblong, or circular clusters, called sori, in some few instances naked, but in the generality of species covered with a similarly shaped indusium. The origin of this integument is undoubtedly similar to that of the scales, namely, disrupted epidermis, while the thecæ themselves arise from and are nourished by the veins. As a proof of this, it may be remarked that those veins which do not lead to sori, are swelled at their extremity; as may be very plainly seen in fertile fronds of *Polypodium vulgare*. These enlarged vessels are but abortive thecæ, the sap not being sufficiently elaborated to bring them to perfection, as evidence of which the swelled terminations of the veins are filled with oblong, free, grey-coloured bodies, the embryos, as it were, of future capsules.

**GEOGRAPHY.**—The Distribution of the Ferns in Britain offers nothing peculiar. They abound chiefly in the more woody and moist counties, are rarely found growing upon chalk, nor, except two species, near the sea; some affect the highest mountainous situations, others only swampy valleys. Our larger species luxuriate on the banks of ditches, in shady lanes; while the smaller and more filmy kinds are generally found in situations diametrically opposite to these, as on ruins, old walls, &c. As the latter stations cannot be natural to any plants whatever, we are bound to look for their real habitats in situations similar to these artificial ones, as on rocks and lofty banks: and here we find all our most delicate species, furnished with very long roots to run into the interstices of the crags. Moisture and shade are equally necessary to all the Fern tribe; they grow, therefore, for the most part in northern aspects, and on damp, porous stones.

**SOIL AND CULTURE.**—The soil which appears to agree best with the Ferns is a mixture of leaf mould or bog earth, and sandy loam. There is some difficulty in transplanting them with success, and they are very impatient of the knife, so much so, that the common Brakes may be entirely eradicated by cutting down the fronds as they arise for three or four years in succession. The species of *Polypodium*, *Cistopteris*, *Scelopendrium*, *Blechnum*, *Pteris*, and most of the genus *Aspidium* and *Asplenium*, when once established in a garden, thrive well in the borders or on rock work. Their place of growth must not be too

exposed, yet few plants suffer more from a contaminated atmosphere than this tribe. *Cryptogramma Crispa*, *Grammitis Ceterach*, *Aspidium Lonicitidis*, *Asplenium lanceolatum*, *marinum*, *viride* and *septentrionale*, seem to languish for their native freedom. They require the shelter of a frame or greenhouse to compensate for the purity of the air of their lofty or exposed homes.

Ferns are easily propagated from the spores, nothing more being necessary than putting into a garden pot some stones or broken rubbish to within two inches of the top, covering these with an inch in depth of very finely sifted sandy loam, and then sowing the spores upon it, covering the whole with a flat piece of glass, and placing it in a green house.

VIRTUES.—The uses of the Ferns are not very conspicuous. Their bitter principle renders them unpalatable to all creatures. Neither men nor brutes employ any species as an article of food, unless driven by the necessity of hunger; and even the little insects that infest herbaria refuse to prey upon them. They are not, however, wholly useless either in medicine or the arts. Their nauseous taste renders them efficacious in expelling intestinal worms; some of them have been used as a substitute for hops in brewing, and with better success than most other plants, on account of the tannin and gallic acid they contain, precipitating the feculent matter in the wort. The same constituent principle renders them also serviceable in preparing kid and other light leathers, and they yield much comparatively pure potash when burnt. The dried fronds of the common brakes are valuable to pack fruit in, and as they retain moisture less, are much better than straw to shield garden plants from frost. Except for these uses, the British Ferns have been little employed, unless, indeed, for those purposes to which most plants when dry are available, namely, for thatch, for fodder, and for fuel.

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## HYMENOPHYLLACEÆ.

(*Containing the Genera Hymenophyllum and Trichomanes.*)

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TRICHOMANOIDEÆ, *Kaulf.*; FILICES DESCISCENTES, *Spreng.*;—PART OF GYRATEÆ, ANNULATEÆ, POLYPODIAEÆ, GLEICHENIACEÆ, FILICES VERÆ, HYMENOPHYLLÆ, &c. of *Authors*.

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STRUCTURE.—The two plants contained in this order long maintained a situation among the dorsal Ferns, though improperly, because their fruit is not dorsal but marginal, growing in a distinct and differently organised receptacle. The annulus corresponds in its functions, jointed appearance, and elasticity, to those of the last tribe, except that instead of its being a continuation of the foot stalk of the theca, it is placed obliquely or transversely, and of consequence the theca bursts vertically. For this reason, *Hymenophyllum* and

*Trichomanes* form an order separate from the *Polypodiaceæ*. Besides the difference in the fruit, the texture of the leaves is much more cellular than in the last order. The stem of each is quite smooth and round, and contains but one bundle of spiral vessels which is solid and forms an axis. The *Thecæ* arise from the veins still more evidently than even in the preceding order, as the receptacle is in the place of a lobe of the leaf. The laminæ of the lobe contracted form the valves of the receptacle, and its vein or nerve exists as a central column, covered with fructification; in *Hymenophyllum* terminated thereby, in *Trichomanes* the vein is prolonged much beyond the thecæ. The root of *Trichomanes* is thick, black, and very hairy, that of *Hymenophyllum* very long, creeping, and matted together.

**GEOGRAPHY.**—The native habitations of these elegant and delicate plants are moist rocks, and they are so impatient of restraint, that one method alone has succeeded in domesticating them, all the usual art and attention of the gardener ending in disappointment. Mr. Ward, of Welleclose Square, finds them and very many other species thrive well in air-tight cases, suffering the moisture which their pores exude to be absorbed again by the roots, while at the same time they are preserved from external injuries and sudden changes of temperature. Mr. Mackay remarks, in his "*Flora Hibernica*" (lately published), that he has succeeded in cultivating the *Trichomanes* to perfection, by placing the pot in which it is planted in the greenhouse, under a hand glass, a method which, it will be seen is exactly analogous to the foregoing, as Mr. Ward's air-tight glasses are kept in the house.

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## OSMUNDACEÆ.

(*Contains only the genus Osmunda.*)

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OSMUNDACEÆ, *Br., Kaulf., Lind., Hook., Agard.*;—OSMUNDEÆ, *Spreng.*;—SCHISMATOPERIDES, *Willd.*;—SPURIE GYRATEÆ, *Swz.*;—RIMATEÆ, *Mohr.*;—ACROGYRATEÆ, *Bernh.*;—EXANNULATEÆ of *Modern Authors.*

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**STRUCTURE.**—This order varies very little from the two former, except in the fructification. The rachis is similar in veneration and structure, the mixed vessels are arranged in the indigenous species in part of a circle like the letter ©. The cuticle of the stem is void of stomata, but on the under surface of the foliaceous part of the frond they are very large, round and abundant. In the fruit, a great difference exists between this and the Annulate Ferns. The thecæ are transparent and wrinkled, but not ringed; are not torn asunder irregularly, but open at a distinct longitudinal fissure, and are thus shown to be regularly two valved. They are not fixed at the back of a leafy frond but



densely clustered at the top into a large upright raceme, which gradually increases in size, in consequence of the leaflets of the frond becoming changed into similar clusters of thecæ, and thus proving the origin of the whole.

GEOGRAPHY.—As the order contains but one British plant, the above is a description of a single individual; it is the largest of our Ferns, inhabiting woody and swampy situations, adding beauty to a foreground, but scarcely of farther utility. Gerard tells us that it was used in his time for inward bruises.

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## OPHIOGLOSSACEÆ.

(Contains *Botrychium* and *Ophioglossum*.)

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OPHIOGLOSSACEÆ, *Br., Lind., &c.*;—OPHIOGLOSSÆ, *Spreng.*;—FILICES, *Linn., Smith, Hook., &c.*;—STACHIOPTERIDES, *Willd.*;—BIVALVIA, *Hoffm.*; VALVATÆ, *Web., Mohr.*;—AGYRATÆ, *Swz.*

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The two plants contained in this order are very near in general structure to the last order, yet in some important particulars they differ very materially. Their root is smooth, fibrous and yellow, not creeping, nor hairy: and giving rise to one or at most two fronds only, which issue from the ground with a straight and not circinate veneration. The frond half way up divides into a leafy expansion exactly similar in its dichotomously branched veins, reticulated cuticle, cellular substance, and numerous stomata, to that of the Polypodiaceæ. The thecæ are sessile, opaque, ringless, smooth, collected into a simple or compound spike, and are supposed to arise as in the last described order, from the leaf itself. The thecæ open by a regular transverse fissure, emitting smooth, yellow, very minute seeds, those of *Botrychium* in pairs. The stems of both genera are perennial, herbaceous, and hollow, that of *Botrychium* containing its ducts in two bundles near the centre of the stem, that of *Ophioglossum* in from five to seven bundles, seated between two cylindrical cuticles, and by their pressure forcing the inner one into a tortuous form.

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## ISOETACEÆ.

(Containing *Isoetes* only.)

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LYCOPODIACEÆ, *Lind., Decan., Brongn.*;—MARSILEACEÆ, *Hook.*;—MISCELLANEÆ, PART OF RHIZOSPERMÆ, RHIZOPTERIDES, HYDROPTERIDES, &c.

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The genus *Isoetes* has in all arrangements of British plants been associated with *Pilularia*, on account of their both being water plants, both having round and filiform leaves, and two kinds of grains or capsules; but, except in these

particulars, they are totally different from each other. The roots of *Isoetes* are tufted, composed of round, smooth, branched fibres; its leaves grow from a crown, and consist of four hollow tubes, but so brittle are they that the cells are often broken into each other by the pressure used in drying the plants, and therefore the leaf generally appears as a single tube, divided into cells by transverse dissepiments; it is so swelled at the base that the joint or cell next the root becomes a receptacle for the fruit, which being of two kinds, as in *Pilularia*, are considered analogous to them, viz. pollen and spores respectively, the former in fine powdery grains in the inner leaves, the real spores or seeds being confined to those on the outside of the plant. These larger globules are not single round spores but each is composed of three spores joined together vertically; their junction shows at their apex three radiating lines, which were for a long time considered as the hilum of the seed. The attachment and arrangement of the globules within the receptacle are very beautiful and remarkable. The theca when cut across exhibits a number of transverse bars, to which the spores are attached by little footstalks, there being four on each bar, set crosswise with each other. The leaves are said to have stomata, and to be circinate in vernation, but neither of these is the case. Being a submersed water plant, of course it is without stomata, and Martius expressly says, vernation not circinate, but only a little bent, an observation confirmed to me by four or five botanists of eminence.

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## MARSILEACEÆ.

(Including only *Pilularia*.)

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PART OF THE MARSILEACEÆ, *Br.*, *Brongn.*, *Dacan.*, *Hook.*, *Grev.*;—HYDROPTERIDES, *Willd.*;—RHIZOSPERMÆ, *Roth*;—RHIZOPTERIDES, *Mart.*;—RADICALIA, *Hoffm.*;—RHIZOCARPÆ, *Batsch*.

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The stem of *Pilularia*, which is the only English genus of this order, is creeping, and set at intervals with leaves, roots, and fruit. The leaves, or, as some call them, petioles, curled up in vernation, as in the Polypodiaceæ, and a cross section of them shows that they are divided longitudinally into six triangular cells, separated from each other by septa radiating from the centre, and forming by their union a kind of axis, composed of longitudinal ducts or spurious tracheæ, showing that the structure of the leaf although without a central cavity, is in a great degree analogous to that of the stem of the Equisetaceæ.

The thecæ are round, coriaceous, brown and hairy, divided into four cells, and contain globules of two kinds, the first small round grains, said to be pollen, but under the microscope appearing to be merely particles of *fecula*.



These occupy the upper part of each theca; on the lower part of it are found much larger grains, generally supposed to be spores contained in membranous bags. The spores themselves, according to Sir J. E. Smith, are oval, rather pointed, and contracted in the middle. A curious circumstance is said to attend the germination of *Pilularia*, that, although the theca contains several bags of spores, yet it never produces but one plant, (at least thus it is stated in Lindley's Nat. Sys. ed. 2, page 416.) Is this one of the numerous instances in which theory and practice are at variance, or is it a fact? If the latter, may we not rather suppose the coriaceous fruit to be a single seed, its larger grains cotyledons, its smaller fecula? As if to confirm this view of them, Mr. Lloyd, in a paper on the Marsileaceæ, read before the British Association, 1836, says, that they grow from a determinate point of their surface; if so, they are true seeds or buds, and not spores. He agrees also with me, that the plants are not furnished with spiral vessels.

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## LYCOPODIACEÆ.

(Comprises only *Lycopodium*.)

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LYCOPODIACEÆ, Br., Decan., Hook., Lindl., Burn.;—LYCOPODINEÆ, Swz.;  
LYCOPODEÆ, Spreng.;—BIVALVIA, Hoffm.;—VALVATÆ, Web., Mohr.;—  
STACHIOPTERIDES, Willd.

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STRUCTURE.—The Lycopodia resemble the Mosses in habit, the Ferns in vascular structure and foliaceous texture, and partly the Marsileaceæ in fruit. The Stems are rigid, leafy throughout their whole extent, branches not subterranean, but upright or trailing along the ground, frequently to the distance of many feet, and throwing out short, stiff, smooth radicles wherever they touch the soil. A transverse section of the root shows the longitudinal ducts to be compressed into an axis. In the stem they are arranged, as in the Ferns, into various cylindrical bundles, the centre of which is filled with a cellular tissue, looser than the remaining part. Whether or not the ducts here and in the other fern allies are really spiral vessels, remains to be proved, though there is little doubt that they are so, as true tracheæ seem always to accompany stomata, and in this tribe the stomata on the cuticle of the leaves are very abundant, the cuticle itself being reticulated, not as in the Ferns, but into regular four-sided meshes.

The Thecæ of fruit are sessile, in the axils of the leaves, of two kinds, one two-celled, opening at a longitudinal fissure, containing very fine smooth resinous grains, which are supposed by most botanists to be pollen. The other kind of Theca is three or four-valved, opening at a transverse line, and

contains from three to five round, slightly tuberculated grains, many times larger than the preceding. That these are the true sporules of the plant is evident from their germination, and Willdenow says that he has seen the smaller grains grow also; if so, they likewise must be spores, but as they are so very different in size and appearance it is supposed that some mistake has arisen. Mr. Salisbury in vol. 12 of the Linnæan Transactions, describes the germination of one species, which presents strange anomalies, throwing out a radicle and plumelet in a manner similar to the monocotyledonous plants, and yet appearing immediately afterwards with two leaves, which he represents as cotyledons.

**GEOGRAPHY.**—All the British species, except *Inundatum* are most prevalent in airy, exposed, dry, and mountainous situations. The *L. inundatum* chooses wet moors for its habitation, I have never seen any British species except the last and *Lycopodium Selago* in a state of cultivation, and I believe that there would be no great difficulty in making them thrive: but if successful they would not add much beauty to the parterre.

**VIRTUES.**—Seldom used in medicine, where safer drugs are attainable. The Orkney Islanders use *L. Selago* and *clavatum* as a cattle remedy; it is said to cure sheep of vermin and of different cutaneous disorders; in the human subject it is an emetic and purgative. The Pollen is highly inflammable, and was once imported in some abundance from Germany and Sweden to imitate lightning, at the theatres, but latterly powdered rosin has been substituted. *Lycopodium clavatum* is said to be valuable in dyeing woollen cloths, and for making mats it is admirable; and the Poles make a decoction of its leaves as a cure for the disorder called *Pliea polonica*. The seeds are with so much difficulty wetted that when spread on the top of the water in a basin, a finger may be plunged to the bottom without becoming wet.

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### EQUISETACEÆ.

*Equisetum*  
(Comprises only *Lycopodium*.)

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**LYCOPODIACEÆ**, *Br.*, *Decan.*, *Hook.*, *Lindl.*, *Burn.*;—**LYCOPODINEÆ**, *Swz.*; **LYCOPODEÆ**, *Spreng.*;—**BIVALVIA**, *Hoffm.*;—**VALVATÆ**, *Web.*, *Mohr.*;—**STACHIOPTERIDES**, *Willd.*

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**CLASS.**—These plants differ widely from all those hitherto described, and certainly approach very much nearer to Flowering plants than Ferns themselves. In fact their relation to the Coniferæ is so strong both in external and internal structure, and their analogy with some other orders so apparent, that I continue them among the Fern allies more in accordance with the opinion of others than my own.

**STRUCTURE.**—The Stems, which are partly beneath and partly above the surface of the ground, are, when young, filled with very loose cellular tissue, and the moisture of this soon drying up, they become hollow. They are set at intervals with joints, covered with toothed sheaths, are regularly channelled or striated, rigid, and covered with fine particles of *Silex*, particularly at the ridges of the *Striæ*. The depressed part of each channel has two longitudinal rows of minute holes or open pores, very different from the usual stomata, and much resembling the pores which Dr. Mohl of Munich represents as occurring in the woody tissue of the *Coniferæ*, now a well-known characteristic of that order, and which it will be recollected there, as here, are arranged in longitudinal lines. A transverse section of the stem shows that between the outer and inner cuticle is a circle (and in *Equisetum fluviale* two circles, alternating with each other), of tubes, distinct from each other, but terminating at every joint of the stem, fresh tubes of a similar character being found at every other joint. These are evidently air tubes, the sap vessels being seated immediately under the cuticle, and around them are the real sap vessels of the plant, which appear to me to be perforated ducts, but Professor Lindley says, that these plants are furnished with spirals, which spirals I presume to be the ducts here alluded to. The inner surface of the stem is frequently more silicious than the outer, so as often to form a very beautiful object even to the naked eye. So abundant is this deposit in *Equisetum Hyemale* that after the vegetable matter has been removed by maceration, the *Silex* has been sufficiently abundant to retain the form of the plant. M. John, of Berlin states that they contain full 13 per cent. of *Silica*.

**REPRODUCTION.**—The reproductive organs are borne in a terminal spike or catkin, composed of several sided shields; from each of these depend hollow, scale-like foliicles, opening inwardly, and emitting greenish, ovate spores, to each of which is attached four club-shaped filaments. These filaments have been considered anthers and the grains upon them pollen, but this is mere conjecture. When the spores are immature, the filaments are twisted tightly round them, but when ripe they become exceedingly elastic and hydro-metrical, so much so, that the irritability occasioned by a change of temperature or moisture causes the spores first to burst the thecæ which bear them, and afterwards to scatter themselves to a considerable distance.

**GEOGRAPHY AND USES.**—They are all found, and thrive best in damp situations, and when cultivated produce fruit constantly and abundantly. They are harmless to, but refused by cattle on account of their husky, rigid texture. They are useless as medicines, but valuable in the arts; their silicious cuticle rendering them valuable as polishing substances for marble, wood, ivory, and even metals.

## GENERA.

The first order of the Ferns is conveniently divided into the suborders *Nudæ* and *Indusiatæ*, according as their sori are naked or covered with an indusium. Their arrangement into Tribes and Genera depends upon the shape and position of the Sori, together with the nature, the adherence, and the manner of opening of the indusium when there is one. In the other orders the same principles are adopted, as far as their structure will admit.

As the orders of the Fern Allies contain each but one British genus, the characters of that genus are but a recapitulation of those of the order itself.

### *NUDÆ.*

Sori round, scattered .....	PLOYPODIUM.
Sori linear or oblong, scattered .....	GRAMMITIS.

### *INDUSIATÆ.*

#### *Indusium distinct from the Frond.*

Sorus round. Indusium cucullate or bladder-shaped ..	CISTOPTERIS.
Sorus round. Indusium cleft into capillary segments ..	WOODSIA.
Sorus round. Indusium peltate, either round or reniform ..	ASPIDIUM.
Sorus linear or oblong, transverse, solitary. Indusium from lateral veins opening towards the midrib.....	} ASPLENIUM.
Sorus linear, transverse, in twin masses.} Indusia folding over each other, and opening outwardly .....	
Sorus linear, longitudinal, close to the midrib. Indusium opening outwardly.....	} BLECHNUM.

#### *Cover part of the Frond itself reflexed.*

Sorus linear, continued around the margin of the frond ..	PTERIS.
Sorus on transverse veins, near to the margin .....	CRYPTOGRAMMA.
Sorus in distinct spots, attached to the cover itself...	ADIANTUM.

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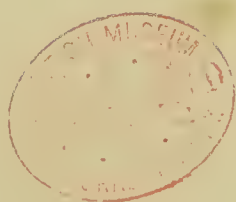
Thecæ in pitcher-shaped, one valved receptacles .....	TRICHOMANES.
Thecæ in compressed, two valved receptacles.....	HYMENOPHYLLUM

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Thecæ petioled, reticulated, terminating a leafy frond ..	OSMUNDA.
Thecæ sessile, smooth, in a separate compound spike ..	BOTRYCHIUM.
Thecæ sessile, smooth, in a separate simple spike ..	OPHIOGLOSSUM

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Thecæ attached to the root, free, and indehiscient ..	PILULARIA.
Thecæ imbedded in the base of the leaves .....	ISOETES.
Thecæ of two kinds, axillary in a leafy spike, or stem ..	LYCOPodium.
Thecæ of one kind, in catkins, terminating a leafless stem ..	EQUISETUM







## GRAMMITIS. Swz. GRAMMITIS.

(γρᾶμμα, a line, alluding to the linear fructification.)

## PLATE OF GENERA, FIG. II.

The three genera, *Grammitis*, *Ceterach*, and *Scolopendrium*, equally claim this plant; the first, because the sori are linear and scattered,—the second, because they are concealed by scales,—and the third because they are between transverse veins; and as the scales which surround the Sori are whiter and more joined together than on other parts of the plant, they may be taken for covers, as some Botanists have considered them; in this case the plant evidently belongs to the last genus.

## GRAMMITIS CETERACH.

SCALY GRAMMITIS. SCALY HARTS-TONGUE. COMMON SPLEENWORT. MILTWAST.

(Plate 1, fig. 1.)

CHA.—Fronde pinnatifid, scaly beneath. Lobes alternate, confluent, blunt, entire.

SYN.—*Grammitis Ceterach*, Swz., Hook., Mack.—*Asplenium* or *Ceterach*, Ger., Plum., Ray.—*Asplenium ceterach*, Linn., Huds., Sibth., Lightf., Bolt., With., Spreng.—*Gymnopteris ceterach*, Bernh.—*Scolopendrium ceterach*, Roth, Galp., Smith.—*Ceterach ollicinarum*, Willd. Decan.

FIG.—*E.B.* 1244.—*Park.* 1046, f. 1—*Ger.* 978.—*Lobel.* 807.—*Bolt.* 12 (*bad*).

DES.—Root perennial, fibrous, black, tufted. Fronds many from the same root, herbaceous, 3 to 6 inches high, blunt, of a thick texture, dark green above, covered with brown scales beneath. Lobes confluent at their base, round, entire, alternate at the lower part of the frond, flat only when young, afterwards curved inwards towards the main rib, thereby exposing more the fructification. Thecæ all the summer, at first concealed by the scales, afterwards bursting through them in oblong, transverse masses, without covers, but surrounded by very delicate, white, membranous scales.

SIT.—On rocks, old walls, &c., chiefly in the South of England.

HAB.—ENG.: On the bridge over the Tamar, Cornwall, *Mr. Jones*. Malvern Abbey, *Mr. W. Christy*. Walls at Winchester, chiefly on the E. and N.E. of the city (1836), *Mr. W. Pamplin*. On the tower of Old Alresford Church, Hants, *Mr. Forder*. Marlock, Somersetshire, *Mr. J. H. Cooper*. Near Plymouth, on the stone walls, *Mr. H. C. Watson*. Walls at Ludlow, Salop, *Mr. J. S. Bayly*. On a wall at Newton, near Melbourne, Derbys., *Rev. A. Bloxam*. Old wall near Cowley, Oxon, *Mr. Baxter*. Common about Settle, Yorks, *Mr. J. Tatham*. Stapleton quarries, near Bristol, *Mr. Anderson*. Dove-dale, Derbyshire, *Mr. T. S. Scholes*. Cheddar, Som., *Mr. W. C. Trevelyan*. Bath, *Mr. C. C. Babington*. On limestone rocks in Lath-kill dale, Derb., *Mr. J. E. Bowman*. Wall at Tocknells, near Painswick, Glouc., *Mr. Merrick*. Topsham and elsewhere in Devon, *Mr. Kingston*. Near Lancaster, *Mr. W. Wilson*.—WAL.: Denbighshire (rare), *Mr. J. E. Bowman*. Walls of a ruin at Treborth, near Bangor, *Mr. W. Wilson*.—IRE.:—Ruins of Saggard Church, *Mr. Kelly*. Walls near Cork, also near Kilkenny, and in county Clare, *Mr. Mackay*. Cave hill, *Mr. Templeton*. Headford, Galway, *Mr. Shuttleworth*.

GEO.—Holland, Spain, France, Switzerland, Nassau, Jena, Leipsic, and other parts of Germany, the Tyrol, Sicily, and the Canary Islands.

## POLYPODIUM. Linn. POLYPODY.

(πολυς many, and πους, ποδος, a foot, from its numerous roots.)

## PLATE OF GENERA, FIG. I.

*Sprengel enumerates no less than 250 species of this Genus; all of them are herbaceous, some a few inches only, and others several feet in height. Inhabitants of most parts of the world, particularly of the Islands within the Tropics; several are found on the Continent of America, and a few are confined to China. Only four species are British.\**

## 1.—POLYPODIUM VULGARE.

COMMON POLYPODY. POLYPODY OF THE OAK WALL FERN.

(Plate 1, fig. 2, 3.)

CHA.—Fronde pinnatifid, lanceolate. Lobes oblong, obtuse, somewhat serrated. Rachis smooth. Root hairy.

SYN.—*Polypodium vulgare*, Tourn., Ger., Park., Ray, Linn., Huds., Lightf., Plum., Swz., Spreng., With., Smith, Hook., Mack., Gray, &c.

FIG.—*E.B.* 1149.—*Flo. Dan.* 1060.—*Woodv. Med. Bot. supp.* 271.—*Ger.* 467.—*Bolt.* 18.—*Plu. Fil. t.* A f. 2.

DES.—Root, or rather Rhizomas, creeping horizontally, covered with scales, and numerous stout, branched, hairy fibres. Rachis quite smooth, yellow, void of lobes half way up. Frond from six to twelve inches high, lanceolate, scarcely contracting below. Lobes, oblong, obtuse, and slightly serrated, sometimes wanting the serratures, at others acuminate, while occasionally they are found very much cut and divided. Sori naked, yellow, large, prominent, and arranged in straight lines equally distant from the margin and the midrib of the lobe; each sorus terminating one of the branches of a transverse vein. The plant is perennial and the fruit found throughout the summer.

β. (*serratum*) lobes distinctly, and often doubly serrated.

γ. (*proliferum*) lobes proliferous, or else cloven at the end.

δ. (*cambricum*, Linn.) lobes ovate, deeply cleft on the sides.

ε. (*acutum*) lobes and fronds long, terminating in a sharp point.

Mr. Mackay remarks in his "Flora Hibernica," that the Irish plant is somewhat different from the *Polyp. cambricum* of Linnæus. It is in fact our variety γ, which is the same as the *Pol. Virginianum* of Pursh, and intermediate between the usual state of the plant and the *cambricum*; it bears fruit copiously, whereas the real *cambricum* is usually without fruit, both in its wild and cultivated state. We might expect this indeed, from the feather-like

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\* The number of species in a genus is always subject to variation, particularly in one so extensive as Polypody, as newly-discovered plants are always adding to the number, while different classification often divides one genus into many.



appearance of the plant, and the dilation of its lobes, a too great expansion of leaf being here as elsewhere detrimental to the production of fruit.

VIR.—Although still retained in the Pharmacopœias, it is scarcely, if at all used in medicine at the present day. It is feebly astringent, of a bitter and nauseous taste, and has been considered efficacious in catarrhal disorders, and against worms, in doses of from one to two drams of the dried root.

HAB.—The common states of the plant ( $\alpha$  and  $\beta$ ) are generally distributed over the United Kingdom, on trees, walls, banks, and rocks.— $\gamma$ . Woods at Dulwich (1835), *Mr. Saunders and Mr. W. Pamplin*. At Chepstow, Monm., *Sir J. E. Smith*. Braid Hall, near Edinburgh, *Mr. Brown*. South Isles of Arran (1806), *Mr. Mackay*. In the Dargle, county of Wicklow, *Miss Fitton*. Innisfallen Island, Killarney, *Mr. Kelly*.— $\delta$ . On the rocks in some parts of North Wales, but without fruit.— $\epsilon$ . Rocks in North Wales, *With*. South side of King's Park, Edinburgh, *Mr. Brown*. Meadows near Maldon, and other meadows near Ewell, Surrey, *Mr. J. Beevis*. Cobham Park, Kent.

GEO.—Found in most of the middle parts of Europe and North America.

## 2.—POLYPODIUM PHEGopteris.

BEECH FERN. WOOD POLYPODY. SUN FERN.

(Plate 1, fig. 4.)

CHA.—Fronde bipinnatifid. Lower pinnæ deflexed. Lobes obtuse, entire, hairy.

SYN.—*Polypodium Phegopteris* of *Lim.*, *Willd.*, *Swz.*, *Spreng.*, *Huds.*, *Lightf.*, *Bolt.*, *With.*, *Smith*, *Hook.*, *Mack.*—*Polystichum Phegopteris*, *Roth.*—*Polypodium latebrosum*, *Gray*, *Salisb.*

FIG.—*E.B.* 2224.—*Bolt.*, 20 (*not good.*)—*Flo. Dan.* 1241.

DES.—Root perennial, hairy, slender, creeping horizontally. Frond triangular, herbaceous, erect, hairy, 6 to 12 inches high. Pinnæ opposite, very acute, adnate, the lower pair bent forwards, pendulous, and distant from the pair next above them. The lobes of all are obtuse, entire, and directed towards the point of the pinna, particularly the two lowest, which with those on the opposite pinna form a cross. The Rachis is smooth, and without pinnæ on the lower half. Sori round, distinct, very small, brown, and seated around the margin of the lobes.

The pendulous character of the lower pinnæ, and the cruciform direction of their bases are most apparent in vigorous plants, and serve as characters which immediately distinguish this plant from its congeners.

SIT.—In moist woods and rocky dells, chiefly in mountainous countries.

HAB.—ENG.—Rocks at the foot of Cheviot above Langley Ford, *Mr. Winch*. Wensley-dale, Yorks., *Mr. J. Ward*. Around Keswick, Cumb., *Mr. H. C. Watson*. Common about Settle, Yorks., *Mr. J. Tatham*. Cawsey Dean, Durham, *Mr. R. B. Bowman*. Rocks at the Belle Hag, 1 mile from Sheffield, *G. F.* Prestwich Clough & Boghart Clough, Lancaster, *Mr. Merrick*. Egerton Moss, near Bolton, *Mr. W. Christy*. Lidford Fall, Beckey Fall, Dartmoor, Devon, *Mr. Jones*. Norwood, 3 miles from Brentford, Middx., *Mr. J. Beevis*. Isle of Man, *Mr. C. Forbes*.—WAL. :—Llanberris, first and second field towards

Snowdon, *Mr. C. C. Babington*. Aber, Caernar., *Mr. Leighton*. Capel Curig, North Wales, *Mr. T. H. Cooper*. Frequent in Caern., not at any considerable elevation, *Mr. W. Wilson*.—*SCO.*: Grampians, Aberdeensh., Red Caird Hill, W. of Inverness up to 1150 yds. Forfarshire, Sutherland, Dumbarton. Many parts of the Highlands, *Mr. H. C. Watson*. Moray, and Rosshire, *Rev. G. Gordon*. Ben Lomond, *Professor Henslow*. Rubenslaw, Sedburg, &c.—Campsey near Glasgow, *Mr. T. H. Cooper*.—*IRE.*: Powerscourt Waterfall, (right hand side) *Mr. O. Kelly*. Waterfall above Lough Eske, Co. of Donegal, and at other places in the northern counties, *Mr. Mackay*.

*GEO.*—Throughout Germany, and indeed most European countries as far North as Lapland, but not in the South countries. Linnæus received specimens from Canada.

### 3.—POLYPODIUM DRYOPTERIS.

TENDER THREE-BRANCHED POLYPODY.

(Plate 1, fig. 5.)

*CHA.*—Fronde tri-pinnate, tender. Branches drooping. Lobes obtuse, crenate. Sori distinct.

*SYN.*—*Polypodium Dryopteris* of *Linn.*, *Willd.*, *Swz.*, *Ehrh.*, *Huds.*, *Bolt.*, *Lightf.*, *Hull*, *Galp.*, *With.*, *Purt.*, *Smith*, *Hook.*, *Grev.*, *Mack.*—*Poly-stichum Dryopteris*, *Roth.*

*FIG.*—*E.B.* 616 (*excellent.*)—*Bolton* 28 (*bad.*)—*Gerard*, 974.—*Park*. 1044.

*DES.*—Root perennial, creeping, black, slender, slightly hairy. Fronds herbaceous scattered, tender, drooping, smooth, and of a light green color. The three branches (of which the middle may be considered a continuation of the stem) are bent backwards, doubly pinnate. Lobes crenate, oblong, obtuse. Main stem 6 to 8 inches long below the branches, quite smooth, except at the very base. Sori nearly marginal, scattered, remaining perfectly distinct.

*SIT.*—The Borders. Dry stony places, chiefly in mountainous countries.

*HAB.*—*ENG.*: Egerton Moor, near Bolton, *Mr. W. Christy*. Dean Church, Clough, near Bolton, *Mr. J. Martin*. Rocks at the foot of Cheviot, above Langley Ford, *Mr. Winch*. Wooded banks of the White Adder, between the Retreat and Elm Cottage, Northumb., *Dr. Johnston*. Near Richmond, Yorks., *Mr. J. Ward*. N. side of Titterstone, Clee Hill, Salop, *Mr. E. Lees*. Cumberland, up to 500 yards of elevation, *Mr. H. C. Watson*. Durham, *Mr. R. B. Bowman*. Near Yoxhall Lodge, in Needwood Forest, Staffordsh., *Mr. C. C. Babington*. Dry places in Lancashire (sparingly), Hill Clif, Cheshire, and Warrington, *Mr. Rylands*. Higher part of the Tees, *Mr. J. Hogg*. Froddesley Hill, Salop, *Rev. W. Corbett*. Boghart Hole, Clough, and Prestwich Clough, Lanc., *Mr. Merrick*. Rocks at the Belle Hag, near Sheffield, *G. F.* Near Bristol, *Miss Worsley*.—*WAL.*: Craig Breidden, Montgomerysh., *Mr. J. E. Bowman*. Rhaiadr-y-Wenol Tŵll Du, Caernarvonsh., *Mr. C. C. Babington*. Frequent in N. Wales, and observed near Tŵll Du at an elevation of 1000 feet and upwards, *Mr. W. Wilson*. Just leaving Llangollen, on a slate rock, *Mr. W. Wilson* and *Mr. Bowman*.—*SCO.*: Moray Rossh., *Rev. G. Gordon*. Perthshire, Forfarshire, Aberdeenshire, *Mr. H. C. Watson*. Hawthorn Dean, near Edinburgh, *Mr. T. H. Cooper*.—*IRE.*: On the mountains of Mourne, Turk Mountain, Killarney, Mam-turk, Cunnamara, Tullamore Park, &c. *Mr. Mackay*.

*GEO.*—Throughout great part of Europe and North Asia

## 4.—POLYPODIUM CALCAREUM.

RIGID THREE-BRANCHED POLYPODY. LIME POLYPODY.

(Plate 1, fig. 6.)

CHA.—Fronde tri-pinnate, rigid. Branches upright. Lobes obtuse, deeply crenate.

SYN.—*Polypodium Calcareum*, Swz., Willd., Smith. Hook., Pursh., Galp.—*Polypodium Dryopteris*, Bolt., Dicks.—*Polypodium Dryopteris*  $\beta$ , With., 2nd edit.—*Polypodium Robertianum*, Hoffm.—*Nephrodium Dryopteris*, Michx.

FIG.—*E. B.*, 1525.—*Bolt.* 1.—*Ger.* 1135.

DES.—This is so similar to the last, that when dried they are scarcely to be distinguished, hence the doubt of their claim as distinct species; but when growing the eye will instantly see the difference between the two. The *P. Calcareum* is known from its root being thicker and less creeping, its frond rather large in size, much more rigid, quite upright, and of a dark green colour, its lobes more deeply cut, and stem more scaly towards the base, and on the upper part sprinkled over with fine white hairs; its sori are browner and more numerous.

I know not if the pubescence of the stem be a constant character; if so, it alone is a sufficient diagnosis. My specimens are all hairy, and are the true plant received in 1835 from Mr. Wilson.

SIT.—On moist, shady rocks, &c.

HAB.—Matlock Bath, Derbys., *Dr. Howitt*. Road-side under the Lover's Leap, near Buxton, Derbys., *Mr. H. C. Watson*. Cheddar Cliffs, Somers., *Mr. W. Christy*. Arncliffe and Gordale, Yorks., *Mr. R. B. Bowman*. Near Lancaster, *Mr. Gibson*. Sheddin Clough, 3 miles from Burnley, Lanc., *Mr. Leyland*. Common about Settle, Yorks., *Mr. J. Tatham*. Not found in either Scotland or Ireland.

GEO.—Recorded by Pursh and Michaux as occurring throughout North America from Canada to Pennsylvania, and no doubt this is correct, as the description of Pursh so exactly accords with our plant; though Swartz says that it is found in England only.

## WOODSIA, Br. HAIR-FERN.

(Named in honor of Mr. J. Woods, an eminent English Botanist.)

*Mr. Brown first separated from the Polypodium, &c. this very distinct genus, which contains only two British and four foreign species, all very small plants, and natives of mountainous regions. The indusium is very singular and beautiful: it is attached under the mass of thecae, enclosing them at first in a bag, it becomes split into numerous segments, which look like hairs interspersed with the thecae, and were so considered until Mr. Brown showed their true nature in Trans. Linn. Soc. vol. 11.*



## WOODSIA ILVENSIS.

OBLONG WOODSIA. HAIRY WOODSIA. DOWNY HAIR-FERN.

(Plate 1, fig. 7.)

CHA.—Frond pinnate, oblong, scaly. Pinnæ oblong, blunt, deeply cut, crenate.

SYN.—*Woodsia Ilvensis*, *Brown, Smith, Hook., Spreng.*—*Polypodium Ilvense*, *Suz., Willd., Schk.*—*Acrostichum Ilvense*, *Linn., Huds., Ehrh.*  
—*Polypodium Arvonicum* of *With.*, in description but not in references.

FIG.—*E. B. Supp.* 2616.—*Flo. Dan.* 391.—*Pluk. Phyt.* 281, fig. 4, (good.)

DES.—Root perennial, tufted, black, smooth. Fronds numerous, one to four inches high, covered with capillary, brownish, white scales. Rachis scaly, one-third of it without pinnæ, the upper two-thirds containing 6-10 pairs, placed nearly opposite to each other. Larger pinnæ cut into 4-6 blunt segments on each side. Sori scattered, convex, consisting of five or six roundish thecæ. Cover torn into a few capillary divisions.

Mr. Sowerby observes, that the capillary segments of the indusium are not so numerous as in the next species, and the thecæ more spherical. The plant cultivated at Kew Gardens, and sold at the London nurseries under the name of *Woodsia Ilvensis*, is in every respect different from our plant, which is much smaller, and less white and downy than that sold under its name.

HAB.—Near Richmond, Yorks., *Mr. J. Wood.* Higher parts of the Tees, *Mr. J. Hogg.* Snowden, *Mr. J. E. Bowman.* Rocks between Glen Dole and Glen Phee, Forfarshire (near where *Oxytropis campestris* grows), Clova Mountains, at 550 yards of elevation, *Mr. H. C. Watson*, (from which station it is larger than the Welsh plant). On the Basaltic Rocks, called Falcon Clints, near Caldron Spout, Teesdale, *Mr. R. B. Bowman.* Near Glyd yr-vawr, and near Lyn-y-cwm, *Mr. Winch.* Last seen in July, 1836, by *Mr. W. Wilson.*

GEO.—Found in different parts of Germany, as on the Alps of Salzburg and Carinthia, the Giant and Hartz mountains, &c. In Sweden, Norway, and rocks in the isle of Elba or Ilva (hence the name *Ilvensis*), also in Italy, Siberia, and on the Pyrenees. Pursh says from Canada to Virginia, but it may be much doubted if our plant be here indicated.

## WOODSIA HYPERBOREA.

ROUND LEAVED WOODSIA.

(Plate 1, fig. 8.)

CHA.—Frond pinnate, oblong, nearly smooth. Pinnæ triangular, blunt, deeply crenate.

SYN.—*Woodsia hyperborea*, *Br., Hook., Smith, E. Fl., Galp.*—*Acrostichum Alpinum*, *Bolt.*—*Ceterach Alpinum*, *Lam., Decan.*—*Polypodium hyperboreum*, *Suz., Willd., Spreng., Smith in E. B.*

NOTE.—I cannot refer to *Withering's* *Polypodium Arvonicum* and *Ilvense* with certainty, as his description of these two plants is very obscure and far from characteristic.

FIG.—*E. B.* 2023.—*Bolt.* 42.—*Linn. Trans.* vol. 11.—*Pluk. Phyt.* 89, f. 5.

DES.—Root perennial, fibrous, black, tufted, and very long, giving

rise to many oblong fronds, from two to four inches high. Lower half of the stem covered with light brown capillary scales, and about eight or ten pairs of pinnæ, only the two or three lower pair opposite, and these not constantly so, all nearly smooth, bluntly triangular, deeply crenate, or cut into two or three segments on each side. The upper half of each pinna larger than the other, and in luxurious specimens cut into lobes near the stem. Sori from six to ten on each pinna, placed near the edge, light brown, very large, and therefore often confluent.

From the very numerous segments of the indusium, a sorus appears like a bunch of hairs. The discriminating character is, however, chiefly the less cut, shorter, and more alternate pinnæ. The plant known as *Woodsia Hyperborea* by gardeners is in reality a large variety of *Woodsia Ilvensis*, known as such before the separation of the present from that species.

SIT.—Found only on the highest rocks and mountains of Wales & Scotland.

HAB.—Ben Lawers, *Dr. Murray* and *Mr. W. Wilson*. Clova Mountains, *Mr. G. Don*. Glen of the Dole, Clova, *Mr. Brand* and *Mr. Watson*. Craig of the Chailleach, Perthsh., *Mr. Maughan*. Mael Ghyrdu, Perthsh., on Snowdon, below Bulch-y-Saeth (Clogwyn-y-Garnedd), at an elevation of 2500 feet and upwards, very sparingly, *Mr. W. Wilson*.

Note :—*Mr. C. C. Babington* says, "I was not able to find this plant on Glydr Fown, Caernarvonshire, July 1835, although in company with *J. Roberts, Esq.*, of Bangor, who knew its station well. It is, I fear, exterminated in that place.

GEO.—Lapland, Germany? France? (*Swz.*) Lulea, in Lapland (*Spreng.*) Canada, and high mountains of Pennsylvania and Virginia.

## CISTOPTERIS, Bern. BLADDER-FERN.

(κιστος, a bladder, φερος, a fern; the indusiums being like bladders.)

This genus is distinguished by its indusiums being inflated like bags, not being attached by a central column, but only by the outer edge, tearing irregularly, and finally, either quite bent back or thrown off altogether. They first open on the top, or on the side nearest the apex of the frond or pinna.

### 1.—CISTOPTERIS DENTATA.

TOOTHED BLADDER FERN.

(Plate 1, fig. 9, 10.)

CHA.—Frond bipinnate, oblong, lanceolate. Pinnæ ovate, lanceolate. Pinnules ovate, obtuse, crenate. Sori distinct.

SYN.—*Cystea dentata*, *Eng. Flo.*—*Cyathea dentata*, *Eng. Bot., Dav. W. Bot. Galp.*—*Polypodium dentatum*, *Dicks., With., Hull.*—*Aspidium dent.*, *Swz., Willd., Hook. in Fl. Sco., Decan.*—*Athyrium dentatum*, *Gray.*

FIG.—*E. B.* 1588.—*Pluk. Phyt.* 179, f. 5 (a cultivated specimen).—*Bolt* 27.

DES.—Root tufted, black, fibrous. Fronds numerous, oblong, lanceolate, six to nine inches high, deciduous. Stem slender, smooth, green, except at the lower part, winged near the apex,

without pinnæ for one-third of its height, above this bearing about 14 pairs, opposite to each other. Pinnæ ovate, blunt, length twice their width, their main rib winged. Pinnules about ten pairs in the larger pinnæ, decurrent, ovate, obtuse, erenate or toothed, very rarely cut into distinct lobes, unless in luxuriant specimens, when the frond becomes wider, the pinnules very deeply cut, and sometimes petioled, but never losing their ovate, roundish, blunt form. Sori scattered, and always remaining distinct, Sir J. E. Smith says confluent, but this does not agree with any of my specimens, though probably in hot weather they may be found so.

β. (*angustata*) frond oblong, ovate. Pinnæ ovate, pointed. (Plate I, fig. 10.)

*Cyathea angustata*, *E. B.* and *E. F.*—*Polypodium rhaeticum*, *Dick.*, *Bolt.*—*Aspidium rhaeticum*, *Willd.*—By no means the *Polypodium Rhæti*. of *Linnaeus*, nor the *Polypodium tenue* of *Hoffm.*, which is the *Aspidium intermedium* of modern Authors.

Very distinct as a variety, not a species. It differs from the usual state of the plant only in a rather larger and broader frond, with pinnules doubly toothed and slightly pointed. Our plant in both its varieties is to be known from every state of *Cistopteris Fragilis*, in the shape of its frond and pinnules which in this are very much blunted, rounder, and less divided; its rachis also is shorter and less brittle, and the whole half the size of the next species, and double the size of *Cistopteris Alpina*.

SIT. On rocks in the north of England and Wales.

HAB.—Cader Idris, and on rocks near Wrexham, *Mr. J. E. Bowman*. Common about Settle, Yorks., *Mr. J. Tatham*. Rocks near Barmouth, *Mr. Purton*. Snowdon, *Mr. C. C. Babington*. Craig Breidden, Montgomerysh., *Rev. A. Bloxam*. Castle Dinas, *Mr. W. Leighton*. Ben Lawers, Perthshire, *Mr. R. Maughan*.—β. On lofty hills in the North, *Sir J. E. Smith*. Near Llanberis, Caern., *Mr. Lloyd*. Gordale, in Craven, *Mr. Curtis*. Downton, in Herefordshire, —

GEO.—Common in Germany, Switzerland, Dauphiny, Prussia, Holland, Verona, &c.

## 2.—CISTOPTERIS FRAGILIS.

BRITTLE BLADDER FERN.

(Plate I, fig. 11.)

CHA.—Frond twice-pinnate, lanceolate. Pinnæ lanceolate. Pinnules ovate, pointed, deeply cut, toothed, decurrent.

SYN.—*Cystea Fragilis*, *E. Fl.*—*Cistopteris Fragilis*, *Hook.* in *Br. Fl.*, *Mack.*, *Bernh.*—*Aspidium fragile*, *Swz.*, *Hook.* in *Fl. Sco.*, *Willd.*, *Grav.*, *Lightf.*—*Polypodium fragile*, *With.*, *Lin.*, *Huds.*, *Bolt.*, *Hoffm.*, *Ehrh.*, *Dick.*—*Cyathea fragilis*, *Roth*, *Smith* in *E. B. &c.*, *Galp.*—*Cyclopteris fragilis*, *Schrad.*, *Gray*.

FIG.—*E. B.* 1587—*Bolt.* 45-46.—*Flo. Dan.* 101.

DES.—Root black, fibrous, and tufted. Fronds numerous, deciduous, bright green, from six to twelve inches high, twice-pinnate,



lanceolate, pointed, and finely tapering towards the apex. Rachis very brittle and shining, of a dark brown or black color on the lower part, and quite smooth, except a tuft of scales at the very base. Pinnæ opposite, pointed, about 20 pairs, confined to the upper half of the rachis, and growing nearly at right angles to it. Their length more than twice their width, except the lower pair, which are also distant from the next above them. Pinnules alternate, acute, deeply lobed, crenate or bluntly acute, decurrent and tapering more or less at the base. Sori numerous, confluent, black when young, afterwards a shining brown, and found throughout the summer. Indusium white, with an irregular margin, and soon obliterated or thrown off by the growing thecæ.

In general habit resembling the last species, but instantly to be distinguished by the shape of the frond, which is sharper and longer pointed, as is also the case with the pinnæ and pinnules; the whole is also much more divided, all the larger pinnules being cleft, and not merely toothed, as in every state of *Cistopteris Dentata*. The stem is also darker, longer, and more brittle, and the sori so numerous as soon to become confluent.

No Ferns are more altered by circumstances than this genus; hence the difficulty of distinguishing the species. The varieties, however, are not distinct in themselves, as they may all sometimes be found upon the same plant, and different seasons produce differently shaped and divided fronds: for example, those which arise in ordinary seasons alone answer the above description; a cold spring occasions barren fronds, the pinnules of which are rounded, delicate, wide, crenate, and running much into each other; while long-continued drought or warm weather occasions those fronds which arise in summer to be much smaller, much yellower, more entire, and the sori more crowded. In the extreme state it may be described as follows: Frond linear, oblong. Pinnæ ovate, blunt, pinnate, ovate or round, toothed, quite covered with sori. If the summer continue very wet and cold, the fronds do not take the above character, but have broader and darker coloured pinnules, in this case exactly resembling the cultivated *Cistopteris Dentata*, except in the shape of the frond itself.

SIT.—On alpine rocks, and lofty situations.

HAB.—ENG.: Cumberland, Ruins of Peveril Castle, Castleton, and the Lover's Leap, near Buxton, Derbys., *Mr. H. C. Watson*. Cheddar, Somers., *Mr. W. C. Trevelyan*. Matlock, Derbys., *Dr. Howitt*. Near Wrexham, Denbighsh., *Mr. J. E. Bowman*. Near Richmond, Yorks., *Mr. J. Ward*. About Settle, Yorks., *Mr. J. Tatham*. Nottinghamsh., *Mr. T. H. Cooper*. Near Bristol, *Miss Worsley*. At Exwick, near Exeter, *Mr. Jacob*.—WAL.: Cave at Clogwyn Coch Snowdon, and rocks above Cwm Idwel, near Twll Du, *Mr. W. Wilson*.—SCO.: Aberdeenshire, *Mr. H. C. Watson*. Moray and Rosshire, *Rev. G. Gordon*. Near Maens, Berwicksh., *Rev. A. Baird*. Sutherland and the Kincardineshire Coast, *Dr. Murray*. Near Killin, *Mr. W. Wilson*. IRE.: Rocks and mountains of Kerry, *Mr. Mackay*. Lough Ina, and Lough Derryclare, Cunnemara, *Mr. Shuttleworth*.

GEO.—Common in Germany, Saxony, Switzerland, Holland, &c.

## 3.—CISTOPTERIS ALPINA.

ALPINE BLADDER-FERN. LACINIATED BLADDER-FERN.

(Plate 1, fig. 12.)

CHA.—Frond tri-pinnate, ovate, lanceolate. Pinnules ovate, blunt. Segments linear, obtuse, toothed.

SYN.—*Cistopteris Alpina*, *Hook. in Br. Fl. Desr.*—*Cistopteris regia*, *Bernh.*—*Cyathea incisa*, *Smith in E. Bot., Galp.*—*Cyathea alpina*, *Roth.*—*Cystea regia*, *Smith in E. Fl. & Fl. Br.*—*Polypodium regium*, *Linn., Hull.*—*Polypodium trifidum*, *With.*—*Polypodium alpinum*, *Jacq., Schk.*—*Athyrium alpinum*, *Spreng.*—*Athyrium regium*, *Gray.*—*Aspidium alpinum*, *Swz. Willd., Hook. in Fl. Sco.*

FIG.—*E. B.* 163.—*Jacq. Icon. vol. 3 t. 642.*—*Sequier Pl. Veron. supp. 1, 3.*

DES.—Root black, fibrous, tufted. Frond tri-pinnate, ovate, or ovate lanceolate, deciduous, herbaceous, two to six inches high. Pinnæ about ten pairs, set rather alternately, except the lower pair, their length not twice their width. Larger pinnules broadly ovate, or nearly triangular, repeated cut into broadly linear segments, generally bidentate at the point. Rachis and midribs winged. Sori small, scattered, seated nearly at the apex of the segments. Margin of the indusium entire.

These marks clearly indicate this to be a distinct species, far removed from both the others, and in cultivation instead of approaching the *Fragilis* or *Dentata*, it becomes yet more different, as the pinnules increase in length, but scarcely in width, as in the former cases. In general habit our present species is by far the tenderest and most numerously cleft, with a shorter and less brittle rachis than even *Cistopteris Dentata*.

HAB.—Wall at Low Layton, Essex, 1836, *Mr. W. Pamplin.* Caernarvonsh, *Mr. J. E. Bowman.* Cwm Idwel, *Mr. Griffiths.* On Snowdon, near the Copper Mine, *Mr. Winch.* Ben Lawers, *Mr. Maughan.* Rocks at the Dropping Well, Knaresborough, *Mr. W. Christy.*

GEO.—Jena, Oldenburgh, and other parts of Germany, France, Italy, &c.

Professor Don thinks that the *Cistopteris Regia* and *Cistopteris Alpina* are essentially different, but Sir W. J. Hooker speaks so confidently of the Layton plant being precisely the same as that represented by Jacquin and Schkuhr, which are the same as the *Alpina* of Don, and as our plant at the present time has the wedge shaped pinnules said by Mr. Don to be peculiar to the *Cistopteris Regia*, we are bound to conclude that formerly, when the plant was vigorous, it took one character, and now that it is but struggling for existence it assumes the other.

Mr. W. Pamplin, jun., of Lavender Hill Nursery, Wandsworth, near London, an indefatigable Botanist, is the re-discoverer of this plant, and kindly furnished me with specimens gathered in 1835, one of which is represented entire in the last plate. The first account we have of the plant as British, is by Mr. Forster, in Symon's *Synopsis*, published in 1798.

Mr. W. Wilson writes me, that the Welch stations refer to *Cistopteris Fragilis*, but I believe this to be an error of the pen, and that he intended to have written *Cistopteris Dentata*. I cannot be certain on this point, but certainly I have received the latter plant from Craig Breidden and from Snowdon, under the name of *Cistopteris Alpina*.







## ASPIDIUM, Swz. SHIELD FERN.

(ασπις, a shield, the indusium being of this form.)

### PLATE OF GENERA, FIG. III.

A widely-distributed and extensive genus, of not less than from 160 to 170 species, all of them herbaceous, some evergreen, others deciduous. The indusium is either reniform and fixed at the sinus, when they belong to the genus *Nephrodium* of Brown, or else orbicular and peltate, which is the true character of *Aspidium*. The greater number of the British *Aspidia* somewhat differ from the true character of the genus, as their indusiums, though orbicular, have a deep lateral notch, which occasions them to appear somewhat reniform, and hence also they in some degree cease to be peltate; but the variation is not so great as to render it advisable to separate them into two genera.

### 1.—ASPIDIUM LONCHITIS.

#### ROUGH ALPINE SHIELD-FERN.

(Plate 2, fig. 1.)

CHA.—Frond pinnate. Pinnæ lunate, bristly-serrate. Rachis scaly.

SYN.—*Aspidium Lonchitis*, Swz., Willd., Hook., Smith, Mack., Galp., Spreng., Schk.—*Aspidium Asperum*, Gray.—*Polypodium Lonchitis*, Linn., Bolt., With., Huds., Lightf.—*Polystichum Lonchitis*, Roth, Decan., Hoffm.

FIG.—E. B. 797.—Bolt. 19.—Flo. Dan. 497.—Park. 1042.—Ger. 979.

DES.—Root tufted, black, fibrous. Fronds six to twelve inches high, numerous, dark green, arranged in a circle around the crown of the root, very rigid, not growing upright, but generally half decumbent, forming a flat, cup-shaped plant. Rachis scaly, clothed with pinnæ nearly to its base. The pinnæ are numerous, crowded, stalked, alternate, smooth above, slightly scaly beneath, crescent-shaped, with an auricle on the upper side at the base of each, serrated, with the serratures ending in a bristle, that part of the pinna above its midrib much larger than the lower portion, in position rather declining and bent forwards, so that they very often approach those on the opposite side of the rachis, the back of the frond being outwards. Sori confined to the upper third of the frond, arranged in single rows, black or brown, and very large. Cover orbicular, notched, attached at the centre, and soon becoming shrivelled.

Sir J. E. Smith says, that "this plant dwindles rather than becomes luxuriant when cultivated," as it often is on rock-work, &c. forming a curious, rigid, and pretty plant, not in any way altered from its original characteristics, except becoming less spinous. The American is more spinous than our plant.

HAB.—In situations about 1000 yards, probably 1100 yards above sea level, on the Breadalbane mountains, Perthshire, and plentiful almost every where in



the Highland valleys and the declivities of the mountains. Scarce in England, nor have I ever seen it here. Craig Chailleach, Perth., and Clova mountains, Forfarsh., *Mr. H. C. Watson*. Falcon Clints, near Cauldron Spout, Teesdale, *Mr. R. B. Bowman*. Glen Isla, Forfarsh., *Mr. W. Brand*. Clogwyn-y-Garnedd, Snowdon, *Mr. C. C. Babington*. Aberdeenshire, *Dr. Murray*. Moray and Rosshire, *Rev. G. Gordon*. Higher part of the Tees, *Mr. J. Hogg*. Common about Settle, Yorks, *Mr. J. Tatham*. Base of Benmore, Sutherland, *Dr. Johnston*. Very large in Glen Fee, *Mr. W. Wilson*.—IRE.: In a glen E. of Lough Eske, Donegal; and on Glenade Mountain, Leitrim, *Mr. E. Mackay*. Brandon Mountain, *Mr. W. Wilson*.

GEO.—Silesia, Bavaria, the Tyrol, Switzerland, Sweden, Norway, and the Aleutian Islands.

## 2.—ASPIDIUM LOBATUM.

CLOSE-LEAVED, PRICKLY SHIELD-FERN.

(Plate 2, fig. 2.)

CHA.—Frond bipinnate. Lobes decurrent, spinulose, elliptical, that next the rachis very large.

SYN.—*Aspidium lobatum*, Swz., Gray, Willd., Schk., Smith, Hook. in *Bri. Fl.*, not in *Flo. Scot.*, Forst., Galp., Mack.—*Polypodium lobatum*, Huds.—*Polypodium aculeatum*, Bolt., With.

FIG.—*E. B.* 1563.—*Bolt.* 26, f. 1, (a full-grown) f. 2 (a young plant).

DES.—Root tufted. Fronds growing from a circle, rigid, glaucous green, from 15 inches to 2 feet high, evergreen, perfectly ovate. Lower pinnæ crowded, so as to overlap each other; sometimes, however, the frond is elongated at the lower part, when the pinnæ are proportionably distant. Rachis stout, scaly, and having pinnæ to the very base. Pinnæ short, alternate, lanceolate, pointed, and curved upward, therefore somewhat lunate. Smaller pinnules running much into each other, the larger slightly auricled, decurrent, and that next the rachis so much larger than the rest as to project over its next neighbour, and also partly to conceal the base of the pinna next above it, the inner edge of all the larger lobes running parallel to the rachis and at a little distance from it, so that if held up, a line of light will appear on each side of it, except near the base, where the first lobes are set very close to the main stem, hence perhaps its name of close-leaved. Sori large, in single rows, confined to the top of the frond. Cover orbicular, fixed by the centre, persistent, but easily knocked off.

This species is distinguished from the following, for which alone it can be taken, by the decurrent lobes, and, as Sir J. E. Smith very rightly observes, the much shorter, more crowded, and less scaly pinnæ; added to which the lobes are more entire, being but slightly auricled, very convex, thick, and of a glaucous colour, furnished with a less number of and smaller bristly serratures, sometimes wanting them entirely at the sides. The sori also are more confined to the top and larger than in *Aculeatum*.

SIT.—On shady banks and damp hedge rows, chiefly in the North.

HAB.—ENG.: Sussex and S. Kent, *Rev. G. E. Smith*. Leicestersh., *Rev. A. Bloxam*. Keswick, *Mr. H. C. Watson*. Matlock, Derbysh., *Dr. Howitt*. Common about Settle, Yorksh., *Mr. J. Tatham*. Cawsey Dean, Durham, *Mr. R. Bowman*. Pottery Car, near Doncaster, *Mr. S. Appleby*. Banks of the Eye, *Rev. A. Baird*. Near Yarmouth, *Mr. Paget*. Banks of the White Adder, opposite Edrington Castle, Dulow Dean, &c., Durham, *Dr. Johnston*. At Studley, Sambourne, Overley, and Weatherley, Warwicksh., *Rev. W. Bree*. Near Bristol, *Miss Worsley*. Near Dorking, Surrey; Hants; Kent; &c. *Mr. W. Pamplin*.—WAL.: Near Wrexham, Denbigh, *Mr. J. E. Bowman*.—SCOT.: By the Tees, *Mr. J. Hogg*. Rosshire, *Rev. G. Gordon*. Braid Woods, Edinburgh, *Mr. Brand*. Rosslyn Woods, *Mr. H. C. Watson*.—IRE.: Collinglen near Belfast, *Mr. J. Templeton*. Hermitage, County Wicklow, *Dr. Osborne*. County of Derry, *Mr. D. Moore*. Most plentiful in the northern counties, *Mr. Mackay*.

GEO.—Germany, Switzerland, &c.

### 3.—ASPIDIUM ACULEATUM.\*

COMMON PRICKLY SHIELD-FERN.

(Plate 2, fig. 3, 4, 5.)

CHA.—Frond bipinnate, broadly lanceolate. Pinnules petioled, ovate, distinctly auricled, aristate. Rachis scaly.

SYN.—*Aspidium aculeatum*, Swz., Willd., Hook. in *B. Fl. ed. 3.*, Smith, Galp., Mack., Gray.—*Aspidium lobatum*, Hook. in *Fl. Scot.*, Schk.—*Polypodium aculeatum*, Linn., Huds., Lightf., Ehrh.—*Polystichum aculeatum*, Roth., Decan.

FIG.—*E.B.* 1562.—*Pluk. Phyt.*, 180 f. 1. (not good.)

DES.—Root tufted. Fronds numerous, perfectly lanceolate, evergreen, bipinnate. Pinnæ alternate, gradually tapering, close together, their midribs covered with hair-like scales. Lobes ovate, distinctly petioled, serrate, spinulose, and with an auricle on the upper side at the base of each; that next the rachis larger than the rest, but not so much so as in the last species, all remaining

\* As many gentlemen distinguished for their Botanical knowledge consider the *Aspid. Aculeatum* and *A. angulare* as distinct species, it is necessary that I should state the reasons why I have blended these two plants together. I have not been guided by any desire of innovation, believing unsteadiness of nomenclature and of classification to be the bane of science, but because after the most careful examination of specimens from all parts of Great Britain where they grow, and after consulting all the most celebrated practical Botanists that I have the honor to be acquainted with, I have found it absolutely impossible to draw the line of demarcation between the plants. To delineate extreme states of any variable plant is easy enough, but where there is so regular a gradation from the robust pointed pinnules to the blunt and delicate ones, the difficulties of discrimination are insurmountable. Also upon writing to various gentlemen for specimens and habitats, I have received the same plant repeatedly under the two names, and it is very remarkable that the habitats received invariably refer to both varieties, though they have not always been received from the same person. Thus Dr. Johnston says that both grow at Pease Bridge, Durham; Mr. Bowman says of *Aculeatum*, near Richmond, Yorkshire; while Mr. J. Tatham notes the same place as a station for the *Angulare*. Thus doubts arise if the same or different plants are indicated. The name *Angulare* appears, however, by far the more commonly given to it, and I should for this reason have preferred it to *Aculeatum*, in deference to the opinion of my countrymen; but foreigners give the name *Angulare* to an Hungarian Fern very different from ours, and as *Aculeatum* is the specific name of all authors who have combined the two Ferns, and is besides more expressive, I have adopted it.



distinct from each other nearly to the point of the pinnæ, although sometimes so crowded as to overlap each other. Rachis clothed with pinnæ to its base and very scaly. Sori distinct, brown, small. Cover orbicular, fixed by its centre, soon withering.

This plant varies much in the sharper or blunter shape of the lobes of the leaves, for which reason it is sometimes extremely difficult to decide if a frond be of this species or the former. Luxuriant plants assume much the appearance of *Lobatum*, as the large pinnules become slightly decurrent: but in this state they become somewhat deeply cut, or even compound, while in the last species they are truly entire, losing their serratures instead of becoming more cleft by culture.

β (*lonchitidoides*)\* pinnules combined, forming nearly a pinnate frond. *Filix Lonchitidi affinis*, Ray. *Aculeatum* β, Smith in *E. Fl.* *Lobatum*, Hook. in *Br. Fl.*—FIG.—Plate 2, f. 4, Pluk. *Phyt. t.* 180, f. 3. (*good*).

γ (*angulare*) Pinnules blunt, distinctly auricled, Rachis very chaffy. *Aspidium angulare*, Smith in *E. Fl.*, Hook, Mack, Willd. *Aculeatum* β, Smith in *Fl. Br.*—FIG.—Plate 2, f. 5 a. *E. B. Supp.* 2776.

δ (*linearis*) Pinnules linear and very sharp pointed.—FIG.—Pl. 2, f. 5 β.

These are well marked varieties, yet not sufficiently distinct either in habit or character to constitute separate species. The var. β is not very scaly, and in form and size exactly intermediate between our present species and *Aspid. Lonchitis*. The var. γ has, when luxuriant, its lower and larger pinnæ compound when it becomes of course subtripinnate, and larger, (but not comparatively more robust,) thereby differing from the first or normal state of the plant, which alone approaches the last species in occasionally decurrent and convex pinnules.

SIT.—Common in hedge rows, damp banks, &c. chiefly in the south; neither the plant nor any variety of it except *Lonchitidoides* is recorded as growing in Scotland, while the former species is almost exclusively confined to that country and a similar range in Ireland.

HAB.—Near Gurnet Bay, Isle of White, Prof. Henslow. Kingsteignton, Devon, Mr. Anderson. Sussex, Rev. G. E. Smith. Peasebridge, Durham, Dr. Johnston. Ulverscroft Priory, Charnwood Forest, Rev. A. Bloxam. Near Hastings, Mr. W. C. Trevelyan. Near Richmond, Yorks., Mr. J. Tatham. Warwickshire, Rev. W. T. Bree. Derbyshire, Dr. Howitt. Somerset, Mr. A. Southby. Little Worley Common, Essex, Mr. R. Castles. Isle of Man, Mr. Forbes. Near Wrexham, Denbighs., Mr. J. E. Bowman. Burton Wood, near Warrington, Lanc., and in Cheshire, Mr. Rylands. About Tonbridge Wells and elsewhere, Kent (abundant), and near Bramshot, Hants, Mr. W. Pamplin. Osterley Park, Lampton Lane, and Sion Lane, near Brentford, Middlesex, Mr. J. Beevis. Cickle, near Beaumaris, Anglesea, Mr. W. Leighton. Near Bangor and Caernarvon, Mr. W. Wilson. Colin Glen, Belfast, Mr. Mackay. Hedgebanks, near Carrickfergus, Mr. F. Whittle.—β Glen Fee, Clova Mountains, Mr. W. Wilson. Braid Woods, near Edinburgh, Mr. H. Cooper.—γ Intermixed with and even more common in the extreme south of the kingdom than the first state of the plant.—δ Near Clonmell, Mr. G. S. Gough.—

Geo.—Europe generally, Arabia, Cape of Good Hope, North Africa, on the Green Mountains, Vermont, and other places in North America.

\* This is a variety of *Aculeatum* rather than of *Lobatum*, because when the pinnæ break into lobes, as the larger and lower generally do, the lobes are invariably and very distinctly petioled.

#### 4.—ASPIDIUM THELYPTERIS.

##### MARSH SHIELD-FERN.

(Plate 2, fig. 6.)

CHA.—Frond pinnate, erect. Pinnæ linear, lanceolate, smooth. Segments mucronated. Sori small. Root creeping.

SYN.—*Aspidium Thelypteris*, Swz., Willd., Smith, Hook., Galp., Mack., Pursh.—*Polypodium Thelypteris*, Linn., E. B., Dicks., Ehrh., With., Lightf., (not of Huds.)—*Aerostichum Thelypteris*, Linn., Bolt.—*Athyrium Thelypteris*, Spreng.—*Polystichum Thelypteris*, Roth.

FIG.—E. B. 1018.—*Flo Dan.* t. 760.—*Bolt.* 43, 44.

DES.—Root creeping, furnished with long, black, slender, rather smooth runners, giving rise at various points along their surface to black radical fibres, and erect, light green, smooth, ovate, or (when fertile) oblong fronds, each from 6 to 12 inches long, having a slender, and generally smooth rachis. Pinnæ linear-lanceolate, pointed, deeply pinnatifid, petioled, opposite. Segments oblong, obtuse, occasionally with a very small point; the first upper segment on each pinna, much longer than the others. Sori in continued longitudinal lines near the margin of each segment, small, brown or black, at first distant, afterwards confluent. Cover thin, white, round, kidney-shaped, fastened near the centre, and soon lost among the growing thecæ. The barren fronds differ much from those which are fertile; they are altogether wider, shorter and flatter, with the pinnæ horizontal, and rachis void of pinnæ half way up. The fertile fronds have two-thirds of the rachis covered with pinnæ, which are more numerous, deflexed, and curled, particularly at the point. The edges of the segments, bending over the lines of sori, give it an acute appearance.

The only British Fern with which it is possible to confound this is *Aspidium Oreopteris*, from which it differs in its smaller size, lighter color, more ovate frond, not contracting so much below, the folded segments of the pinnæ, and its creeping root. This last character will distinguish it from all our other species of this genus, it being the only one of which the root is not tufted. It is by no means easily cultivated, nor frequent in fruit when wild, as the fertile fronds do not rise till late in the season. While undergoing the process of desiccation for the Herbarium, the elasticity of the annulus of the theca is very apparent, bursting with violence, and scattering the spores in all directions and to a considerable distance. Sprengel says that the plant is glandulous, in which state Hudson describes it as *Polypodium Fragrans*.

HAB.—Filby, Ormesby, &c., Norf., Mr. Paget. Learmouth Bogs, Northumb., Mr. Winch. Allesley, Warw., Rev. W. Bree. Sussex, Mr. Borrer. Somerset, Mr. Southby. Near Settle, Yorks., (searee,) Mr. J. Tatham. Coxton Bogs, Notts., Dr. Howitt. Belton, Suffolk, Mr. Paget. Valley below Cæsar's Camp on Wimbledon Common, planted there some years ago by Mr. Tyton.

Bog on Waterdown Forest, near Tunbridge Wells (1835), *Mr. Pamplin*. Windsor Park and Sunning Hill Wells, Berks., *Mr. J. Beevis*. Knutsford Moor and New Church Bog, near Over, Cheshire, *Mr. W. Wilson*. Near Beaumaris, Anglesea, *Mr. J. E. Bowman*. Border of Lake, near Red Wharf, Anglesea, *Mr. W. Wilson*. Forfarshire (1824), *Mr. R. Maughan*. Common in Scotland, *Sir W. J. Hooker*. Marshes at Glencree, County of Wicklow, and Mucruss, Killarney, *Mr. Mackay*.

GEO.—Pomerania, Mecklenburgh, Prussia, Denmark, Sweden, N. and S. Africa, and in all the United States, but seldom with fruit.

## 5.—ASPIDIUM OREOPTERIS.

HEATH SHIELD-FERN.

(Plate 2, fig. 7.)

CHA.—Frond pinnate, lanceolate. Pinnæ glandulous, deeply cleft. Segments blunt, entire. Root tufted.

SYN.—*Aspidium Oreopteris*, *Swz.*, *Willd.*, *Smith*, *Hook.*, *Galp.*, *Spreng.*, *Mack.*, *Schk.*—*Polypodium Oreopteris*, *Ehrh.*, *Dicks.*, *With.*, *Hull*, *Sibth.*, *Hoffm.*, *Linn.*—*Polypodium Thelypteris*, *Huds.*, *Bolt.*, *Lightf.*, *Hedw.*—*Polystichum montanum*, *Decan.*

FIG.—*E. B.* 1019.—*Flo. Dan.* 1121.—*Bolt.* 22, f. 1 and 2.

DES.—Root tufted, large, black, scaly, fibrous. Fronds several, growing in a circle from a crown, finely lanceolate, tapering at both ends. Rachis covered with fine hair on the upper part, and with a few scattered scales on the lower, delicate green, with a deep channel on the upper side. Pinnæ extending nearly all along the rachis, more or less alternate, sessile, deeply pinnatifid, tapering to a fine point, on the upper side smooth, on the under side hairy, particularly about the main rib, covered with yellowish, shining glands, smelling of turpentine. Segments very numerous, flat, blunt and entire. Sori marginal, at length confluent, covering all the pinnæ. Cover thin, white, kidney-shaped, soon shrivelling up.

The fresh plant may instantly be known from all its congeners by the smell emitted when drawn through the hand, or by holding it up to the light, in which situation it shows very plainly, translucent, minute points, very similar to those seen in *Hypericum Perforatum*, though, be it observed, that unfavorable situation and cold weather will often prevent the formation of, if not obliterate these odorous pores. They are most abundant when the plants grow in sunny but not too dry localities. This Fern can only be mistaken for *Asp. Thel.* or *Asp. Fil. Mas*; it has already been distinguished from the former in describing that plant, from the latter it may easily be known by its more elegant shape, its smaller size and more delicate structure, no less than by its greater smoothness in every part, particularly its rachis. The segments of the pinnæ also are not crenate, as in *Filix Mas*, and the sori, which in that are large, distinct, and confined to the lower half of the segment, are in this plant small, closer together, more numerous, and continued throughout the whole length of the segment, very near the margin.



SIT.—On heaths and in shady lanes, not uncommon in the North.

HAB.—ENG.: Bradwell, Forf., *Mr. Turner*. Coleshill Heath and Corley, Warw., *Rev. W. Bree*. Sussex and Kent, *Rev. G. E. Smith*. Somerset, *Mr. A. Southby*. Near Richmond, Yorks., *Mr. J. Ward*. Keswick, and near Lodore Waterfall, Cumberl., *Mr. H. C. Watson*. Near Chapel Weardale, Durham, and Cawsey Dean, near Newcastle, *Mr. R. B. Bowman*. Dallington Heath, near Northampton, *Mr. Anderson*. Detlick Moor, and near Riley, Derbys., *Dr. Howitt*. N. side of Shotover Hill, Oxfordsh., *Mr. Baxter*. Isle of Man, *Mr. Forbes*. Bailey's Hill, between Brasted and Tunbridge (1835), *Mr. Pamplin*. Coxton and Eddingley Bogs, Notts., and Hartswell, near Farnsfield, *Mr. H. C. Cooper*. Near Warrington, *Mr. W. Wilson*.—WAL.: Near Wrexham, Denbighshire, *Mr. J. E. Bowman*. Llanberis and Nant Gwynedd, Caernarvonsh., *Mr. C. C. Babington*. Frequent in Caernarvonsh., *Mr. W. Wilson*.—SCO.: By the Tees, *Mr. J. Hogg*. Moray, *Rev. G. Gordon*. Glen Isla, Forfarsh., *Mr. W. Brand*. Common in Sutherland, *Dr. Johnston*. Banks of Loch Tay, *Mr. T. H. Cooper*. Aberdeenshire, but not common, *Dr. Murray*. Foot of Craig Challeach, &c. *Mr. W. Wilson*.—IRE.: Powerscourt Deer Park and Waterfall, Mangerton Mountain, *Dr. Osborne*. Lough Corril, Galway, *Mr. Shuttleworth*. Plentiful in Ireland, *Mr. Mackay*.

GEO.—Germany, Italy, Switzerland, Prussia, &c.

## 6.—ASPIDIUM FILIX-MAS.

MALE FERN.

(Plate 2, fig. 8.)

CHA.—Frond pinnate, broadly lanceolate. Pinnæ alternate, deeply pinnatifid. Segments obtuse, crenate. Rachis scaly.

SYN.—*Aspidium Filix-Mas*, *Swz.*, *Willd.*, *Smith*, *Hook.*, *Galp.*, *Mack.*—*Polypodium Filix-Mas*, *Linn.*, *Huds.*, *Bolt.*, *Woodv.*, *Dicks.*, *Ehrh.*, *Ger.*, *With.*, *Lightf.*—*Polystichum Filix-Mas*, *Roth*, *Decan.*—*Polystichum Callipteris*, *Bernh.*

FIG.—*E. B.* 1458.—*Bolt.* 24.—*Woodv.* 49.—*Flo. Lon.* 40.—*Ger. Her.* 1128.

DES.—Root large, tufted, black, and scaly. Fronds growing centrally from a crown, broadly lanceolate, pinnate. Pinnæ lanceolate, pointed, alternate, smooth, except on the under side of the midrib, of a bright green, regularly tapering, curved upwards, and very deeply cleft. Segments oblong, obtuse, slightly crenate at the sides, copiously at the end, very close together, but not overlapping each other. Sori confined to the upper half of the frond, and to the lower half of each segment of the pinnæ, round, large, and very prominent. Cover large, orbicular, with a notch on one side, at first white and transparent, afterwards opaque, and of a fine reddish brown, covering the thecæ even till they are fully ripe.

The large size, robust appearance, and decided character of this plant, obtained for it very early and very aptly the name of Male Fern.

VIR.—Medicinal properties of some importance have been ascribed to it, and with justice. It is retained in most of the Pharmacopœias of Europe as a specific for the larger kinds of intestinal worms, and used very extensively for that purpose by the faculty on many parts of the Continent, and if the employment of it has been discontinued here, it is not because of its inutility,

but from the discovery of other remedies equally potent and better understood. The stem & roots are bitter and astringent, and have been used instead of hops.

$\beta$  (*variegatum*.) White tipped, and edged with green (same habit).

$\gamma$  (*recurvum*.) Pinnæ crisped, turned down. Frond small. Rachis smooth.

$\delta$  (*spinulosum*.) Pinnules serrate, smaller blended together, larger auricled.

The above states of the plant appear constant, besides which it is sometimes found with a cormus, some inches above the ground; Mr. W. Wilson has seen it thus in Caernarvonshire, and Mr. Mackay in Wicklow. A singular variety with the upper pinnæ remarkably compound or branched, has been observed in Bore-hill Lane, below Dorking, Surrey, by Mr. W. Pamplin.

SIT.—Hedge-banks, &c., and in shady lanes throughout the kingdom.

HAB.—I have received numerous habitats from most of the English and Scottish counties, from the extreme south to the Orkney Islands, and yet in some places it is rare. Inchnedamfl, in Sutherland, is one of these.— $\beta$ : Near Keswick, Cumberland, Mr. H. C. Watson.— $\gamma$ : Not very uncommon in dry situations in the south.— $\delta$ : Bomere Pool and Sutton Spa, both near Shrewsbury, Mr. W. Leighton. Nettlecomb, Somerset, Mr. W. C. Trevelyan.

GEO.—North America, throughout Europe, and in Africa.

## 7.—*ASPIDIUM CRISTATUM*.

CRESTED SHIELD-FERN.

(Plate 2, fig. 9.)

CHA.—Frond pinnate. Pinnæ opposite, pinnatifid, oblong, obtuse. Segments ovate, decurrent, crenate, bristled.

SYN.—*Aspidium cristatum*, Swz., Willd., Smith, Hook., Spreng., Galp., Mack., Schk., Pursh.—*Polypodium cristatum*, Linn., Afzel in Stockh. Trans. for 1787.—(Not of Bolt., With., or Huds.)—*Polystichum cristatum*, Roth, Deean, Hoffm.—*Polypodium callipteris*, Ehrh., Hoffm.

FIG.—Hook. in Flo. Lon., new ser. 113.—E. B. 2125. (not 1949.)

DES.—Root tufted. Fronds erect, rigid, yellowish green, bipinnate, oblong, blunt. Pinnæ opposite, 8 to 14 pairs, very distant from each other, short, ovate, oblong, obtuse, very deeply pinnatifid or rather pinnate at their lower part. Segments ovate, crenate, each crenature furnished with two or three small sharp points or bristles, the principal vein in each segment slightly crooked, but the midrib of the whole pinna straight. Rachis slightly scaly only towards the lower part, where for about one-third of its height it is otherwise naked. Sori large, very distinct, black at first, afterwards brown. Cover white when young, very thick, circular, with a lateral notch, and fixed by the centre.

Few plants have occasioned more discussion than this. The difficulty has arisen chiefly because sufficient stress has not been laid upon the simply pinnate character of the frond; had this been regarded more, *Aspidium spinulosum* would not so often have been confounded with it. The *Cristatum*, besides being less divided, has a more obtuse, more linear frond, and contracts very much below. The sori of *Cristatum* are comparatively much larger and



less numerous, and their covers persistent, not hidden by the capsules. It very nearly resembles the American *Aspidium goldianum*.

HAB.—This is one of the rarest Ferns, not only here but on the Continent. The only recorded habitats of it in this country are the Lows in Holt-heath, Norfolk, *Rev. R. B. Francis*; on bogs among alder bushes, at Westleton, Suffolk, *Mr. Davy*; Coxton Bogs Notts, *Dr. Howitt* and *Mr. T. Cooper*. *Mr. Mackay* admits it into the Irish Flora, as growing in the grounds of Sir H. Gough, at Rathronan, near Clonmel, found there by *Mr. G. S. Gough*, in 1835; he says that the Irish plant is acutely serrate.

GEO.—Oldenburgh, Bremen, Mecklenburg, Hanover, and other parts of Germany. New York to Virginia.

## 9.—ASPIDIUM RIGIDUM.

RIGID SHIELD FERN.

(Plate 2, fig. 10.)

CHA.—Fronde bipinnate. Pinnæ alternate. Lobes oblong, decurrent, doubly toothed. Rachis scaly.

SYN.—*Aspidium rigidum* Hook. in *Bri. Flo.*, ed. 3., Swz., Schk.—*Aspidium spinulosum*, Hook. in *Bri. Flo.*, ed. 1.—*Polypodium rigidum*, Hoffm.—*Polystichum rigidum*, Decan.—*Polystichum strigosum*, Roth.

FIG.—*E. B. supp.* 2724.—*Schk. fil. t.* 38.

DES.—Root tufted. Rachis thick, rigid, very scaly all the way up. Frond lanceolate, not contracted below, dark green, erect, from one to two feet high. Pinnæ tapering, alternate, very close together, from 30 to 40 pairs, their stipes very much thickened at their union with the rachis. Lobes distinct, decurrent, oblong, blunt, doubly toothed, but not spinulose, their midrib waved. Sori large and abundant, chiefly on the upper part of the frond. Indusium round-reniform, persistent, white at first, lead-coloured afterwards, covering the whole mass of capsules.

Much diversity of opinion has existed respecting the identity of this very distinct plant, a small state of the *Spinulosum* being very often sent for it. Its *alternate* pinnæ would be amply sufficient to distinguish the two, but in other respects it is essentially different from that more common species. The rachis of the *Rigidum* is very scaly and very much thicker than in the *Spinulosum*, its pinnæ much more numerous and nearer together, the lower pair not broader than the rest, the lobes of all quite decurrent, and not by any means spinulose, besides which the indusia are very large, and so different, as at once to distinguish the two plants; in addition to which it may be remarked, that *Aspidium rigidum* is much darker in color than the *spinulosum*, as it is also than the *cristatum*. It is intermediate between the last and next species in the number of its divisions, but does not resemble either of them in habit or appearance.

HAB.—Found by *Rev. W. Bree*, in 1815, on Ingleborough, near the foot of the mountain, towards the neighbouring village.

GEO.—Switzerland, Prussia, Germany, &c.

8.—*ASPIDIUM SPINULOSUM*.

PRICKLY SHIELD-FERN.

(Plate 2, fig. 11.)

CHA.—Fronde bipinnate. Pinnæ oblong. Lobes finely cut, spinulose. Rachis nearly smooth, white.

SYN.—*Aspidium spinulosum*, Willd., Hook. in *Br. Fl.* (not  $\beta$ .) *Galp.*, *Smith*.  
*Polypodium spinulosum*, Swz., Retz.—*Polypodium cristatum*, Hoffm.,  
*Schreb.*—*Polypodium spinosum*, Schr.—*Polyp. dentatum*, Moench.

FIG.—*E. B.* 1460.—*Flo. Dan.* 707.—*Pluk. Phyt.* 181, f. 2, (*a young plant*.)  
*Schk. fil.* 48.

DES.—Fronde ovate or oblong, always erect and flat. Pinnæ very nearly opposite, smooth, and distinct, as are also the lobes, which are rarely convex. Segments oblong, pointed, doubly serrate, and spinulose. Rachis nearly smooth, swelled at its ramifications, of a whitish color, and generally covered with black dots. Sori scattered, small. Indusium small, brown, soon shrivelling up.

This plant goes by various names among British Botanists. It is repeatedly considered and sent as *Aspidium cristatum* (which see, page 32), and is such of some authors, but not of Smith, Hooker, or Mackay. It is also confounded with the much rarer *Aspid. rigidum*, the diagnostics of which are very distinct, and with the next species, *Aspid. dilatatum*, it is often considered identical, though sufficiently distinct both wild and cultivated, in habit, texture, and color. Our present plant is narrower, less compound, flat, erect, rigid in habit, of a very light green color, the midrib of the lobes more zigzag and prominent, the lower pinnæ rarely twice pinnate, the indusium glandulous, and the whole plant much more delicate than the *dilatatum*.

In a variety of *Spinulosum* given me by Mr. J. Merriek, of Manchester, the lobes on the *upper* side of each pinna are much larger than those on the lower; also, it may be remarked, that in dry situations the lobes will become convex, but this is by no means common.

SIT.—On wet moors, sides of pools and ponds, wet hedge-rows, &c.

HAB.—Titterstone Clee Hills, Shrops., *Mr. J. S. Bayly*. Wood near Dunsford Bridge, Devon, *Mr. Jacob*. Near Torquay, *Dr. Greville*. Pottery Car, near Doncaster, *Mr. S. Appleby*. Sussex and S. Kent, *Rev. G. E. Smith*. Norfolk, *Miss Bell*. Warwicksh., *Rev. W. S. Bree*. Near Richmond, Yorks., *Mr. J. Ward*. Dallington Heath, near Northampton, *Mr. Anderson*. Derbys., *Dr. Howitt*. Bomere Pool, Salop, *Mr. C. Babington*. Tonbridge, Kent, *Mr. W. C. Trevelyan*. Isle of Man, *Mr. Forbes*. Barnes Common, Surrey (near the Water-house), *Mr. Castles*. Somere, Salop, *Mr. Leighton*. Common in Kent, *Mr. W. Pamplin*. Abundant in Essex, *Mr. J. Beevis*. Near the Springwell, Wimbledon Common, *G. F.* In a small state at Woolston Moss, Lanc., and Newchurch Bog, near Over, Cheshire, *Mr. W. Wilson*. Ingleborough, Yorkshire, *Rev. W. Bree*. Near the Windmill on Wimbledon Common, *Mr. W. Pamplin*.—WAL.: Aber, Caern., *Mr. Leighton*. Near Wrexham, Denb., *Mr. J. E. Bowman*.—SCO.: Moray and Rosshire, *Rev. G. Gordon*. Aberdeenshire, *Dr. Murray*. Dumbartonshire, *Mr. J. Hooker*. Anclindenny Woods, Edinburgh, *Mr. Watson*.

GEO.—Switzerland, Dauphiny, Saltzburg, Darmstad, and throughout North America.

## 9.—ASPIDIUM DILATATUM.

GREAT SHIELD FERN. DILATED SHIELD FERN.

(Plate 2, fig. 12, 13.)

CHA.—Frond tripinnate, triangular. Pinnæ opposite, lobes deeply dentate, spinulose, petioled. Rachis scaly.

SYN.—*Aspidium dilatatum*, Willd., Spreng., Forst., Galp., Gray.—*Aspidium spinulosum*, Swz., Sibth., Hook. (not  $\alpha$ ), Mack., Schk.—*Polypodium cristatum*, With., Bolt., Huds., Ehrh., Moench., Lightf.—*Polypodium dilatatum*, Hoffm., Mull.—*Polystichum multiflorum*, Roth.

FIG.—E. B. 1461.—Bolt. 23.—Schk. fl. 47.

DES.—Root black, tufted. Frond tripinnate, triangular, from a few inches to two feet high, dark green, and drooping. Pinnæ opposite, smooth, oblong, obtuse, pinnate, except the lower pair which are doubly pinnate. Lobes ovate, pointed, convex, deeply but irregularly serrated and spinulose, petioled, their midribs straight. Rachis covered with broad, brown scales. Sori all the summer, distinct. Indusiums soon becoming obliterated, round, with a lateral notch.

A very variable plant, altered much by cultivation and circumstances, thus if it grow in a situation which is wet in the spring and dried up in the summer, as on the margin of a pond, it will become var.  $\beta$ , very dark, large, and quite drooping. Continued wet will elongate the frond and separate the pinnæ and lobes as in var.  $\gamma$ . A young plant is only twice pinnate and flat. A dry and rocky, or a confined situation will render the frond small and less divided, the lobes blunt, deflexed, and drooping: thus starved it becomes the *Aspidium dumetorum* of Smith (var.  $\delta$ ). I know not the nature of the habitats in which the reflexed var. ( $\epsilon$ ) of Bree grows, and can only regret that Botanists do not record the circumstances, as well as the places, in which plants are found. The varieties *reflexum* and *dumetorum* are, I believe, not altered by cultivation, and Sir J. E. Smith implies in his description of the latter, that its spores produce the same variety.

$\alpha$  (*dilatatum*) Frond sub-tripinnate, triangular, ovate. Pinnules petioled.

$\beta$  (————) Frond tripinnate, deflexed, triangular. Pinnules convex.

$\gamma$  (————) Frond tripinnate, triangular, elongated. Pinnules somewhat decurrent, and distant from each other.

$\delta$  (*Dumetorum*) Frond small, triangular, drooping. Pinnules blunt.

$\epsilon$  (*reflexum*, Bree.) Frond small. Pinnules concave, and dark green.

SIT. & HAB.— $\alpha$   $\beta$   $\gamma$ . Very common in damp hedge-rows and swampy woods, ascending to an elevation of 1000 yards in many parts of the Highlands, and probably even to 1200 yards on the Cairngorm range.— $\delta$ .: Derbyshire (rare), Mr. J. E. Bowman and Dr. Howitt. Common about Settle, Yorks., Mr. J. Tatham. Powerscourt Waterfall, and side of Djouce Mountain, Ireland (abundant), Mr. Mackay. Black Rock, Cromford, Derby., G. F.  $\epsilon$ .: Plentiful about Penzance, Cornwall, Rev. W. Bree. Ben-na-Baird, Aberdeensh., Mr. H. C. Watson.

GEO.—Common throughout Europe, and from Pennsylvania to Virginia.



## ASPLENIUM. Linn. SPLEENWORT.

(ασπληνον, a medicine to cure disorders of the Spleen, from α and σπλην.)

## PLATE OF GENERA, FIG. VI.

*Sori linear at first, afterwards round and crowded; cover linear, attached to a transverse vein, and opening on the opposite part of the Sorus, towards the central nerve of the pinna. This is a well marked and extensive genus, of which Sprengel enumerates no less than 151 species, of these 10 only are British, which are not at all altered by culture, they are therefore less liable to run into varieties than some other genera. It is only when the sori are in a young state that many species can be known to belong to this genus, as the indusiums are so delicate as soon to be lost among the very confluent sori which at last appear like round spots.*

## 1.—ASPLENIUM SEPTENTRIONALE.

## FORKED SPLEENWORT.

(Plate 3, fig. 1.)

CHA.—Frond simply partite. Segments linear, sharply toothed at their extremity.

SYN.—*Asplenium Septentrionale*, Swz., Willd., Hull, Hoffm., Hook., Smith, Galp., Gray.—*Acrostichum Septentrionale*, Linn., Bolt., Dicks., Ehrh., With., Huds., Lightf.—*Scolopendrium septentrionale*, Roth.

FIG.—*E. B.* 1017.—*Flo. Dan.* 60.—*Bolt.* 8.—*Flo. Lon.* 162.—*Ger.* 1561.

DES.—Fronds very numerous, upright when young, drooping afterwards, rigid, one to three inches high, cleft near the top into two or three linear sharp pointed alternate segments, which in proportion to their size are furnished at or near their extremity with from one to three acute but not spinous teeth. Sori one on each side of the segment nearly longitudinal, concealed at first by a white indusium attached at the outer edge, afterwards the swelling sori throw back the indusia, covering the whole of the segment, and finally curving and contorting it in a curious manner.

Mr. Watson writes thus: "Although quite a northern fern, I observed the young fronds destroyed by a frost of 25 degrees Fahr. in April, 1835. The plant had been under a glass in a cold frame during winter, where the temperature had risen a few degrees higher than outside by day, and never been allowed to sink to the freezing point at night, by a thick covering of mats."

SIT.—On the rocky clefts of mountains, chiefly in the north. Not in Ireland.

HAB.—ENG.: In situations probably exceeding 1000 feet in height in Cumberland, where it occurs sparingly on rocks, between the vale of Newlands and Borrodale. Ingleborough, Mr. H. C. Watson.—WAL.: Craig Ddw. (a mile above Llanberris Church) Caern. Mr. C. C. Babington. Snowdon (rare). Mr. J. E. Bowman. Llyn-y-cwm, N. Wales, Mr. W. Wilson.—SCO.: Arthur's Seat, Edinburgh (above the rail road), Minto Craigs, Jedburg, and in the Orkney Islands, Mr. H. C. Watson. Blackford Hill, Edin., Mr. W. Brand.

GEO.—Holland, Switzerland. Not unfrequent throughout Europe.

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## 2.—ASPLENIUM ALTERNIFOLIUM.

ALTERNATE-LEAVED SPLEENWORT.

(Plate 3, fig. 2.)

CHA.—Frond pinnate. Pinnæ alternate, wedge-shaped, notched,

SYN.—*Asplenium Alternifolium*, *Smith*, *Hook.*, *Dicks.*, *With.*, *Galp.*, *Jacq.*—*Asplenium Germanicum*, *Willd.*, *Hoffm.*, *Ehrh.*, *Lam.*, *Weis.*, *Gray.*—*Phyllitis heterophylla*, *Moench.*—*Scelopendrium Alternifolium*, *Roth.*—*Asplenium Breynii*, *Retz.*FIG.—*E. B.* 2258.—*Jacq. Misc. t. 5 f. 2.*—*Breyn. Cent. 1 t. 98.*

DES.—Frond from one to three inches high, very light green, upright, delicate, about half covered with pinnæ, which are alternate and wedge-shaped, the larger partly three-cleft, the smaller bluntly notched at the end only. Rachis dark at the base only. Sori 2 to 4 on each pinna, small, light brown, becoming confluent, but not occupying the whole under surface. Indusium entire on the margin.

This species is intermediate between the last and *Asplenium Ruta-muraria*, although of a more delicate and erect habit than either; its colour also is much lighter and its sori smaller and less confluent.

The plants sold under this name in the nurseries around London are the true species derived from some plants brought wild from Scotland, about ten years ago, and given to the Countess De Vande at Bayswater, and from her garden distributed around. It quite retains its character in cultivation.

HAB.—Found originally by Mr. Dickson, on rocks in the south of Scotland, two miles from Kelso on the Tweed. Now existing in Perthshire, *Mr. Bishop.* Very sparingly near Dunfermline, near Edinburgh, *Dr. Dewar.* Dunkeld, *Dr. Macnab.*

GEO.—Germany, Sweden, & Switzerland, where it is quite an alpine plant.

## 3.—ASPLENIUM MARINUM.

SEA SPLEENWORT.

(Plate 3, fig. 3.)

CHA.—Frond oblong, pinnate. Pinnæ obtuse, serrate, slightly auricled above. Rachis winged.

SYN.—*Asplenium marinum*, *Linn.*, *Willd.*, *Huds.*, *Bolt.*, *Dicks.*, *Lightf.*, *With.*, *Galp.*, *Smith*, *Hook.*, *Mack.*, *Gray*, &c.

FIG.—*E. B.* 392.—*Lob. Ic.* 814.—*Fl. Lond.* 60.—*Bolt.* 15.—*Ger.* 1143.

DES.—Root very thickly tufted, black, with stout fibres. Frond 6 to 9 inches high, pinnate, irregularly oblong, obtuse. Rachis winged all the way down, black, shining, smooth, without pinnæ at the lower part, above bearing about twenty on each side, mostly alternate, obtuse, about an inch long in the middle of the frond, running at the base into the wing of the rachis, therefore slightly

decurrent, the upper side of each generally auricled, the lower side proportionably truncated, so that the midrib does not run through the middle of the pinnæ. Sori large, transverse, at first linear, then oblong, but never confluent. Indusium white or of a pale brown.

SIT.—Upon maritime rocks or in caves by the sea side, and in one or two inland situations.

HAB.—ENG.: West of Cornwall, *Professor Henslow*. Teignmouth, Dawlish, &c. Devon (common), *Mr. Jones*. Marsden Rocks, Durham, *Mr. R. B. Bowman*. Sussex, *Mr. Borrer*. Above the black rocks at the entrance of the Mersey (Cheshire side), *Mr. H. C. Watson*. Lieut. Phillips, R.N. informed *Mr. Watson*, that he had found it at one of the small towns near Manchester, it is believed Ormskirk, which is far from the sea. Isle of Man, *Mr. C. Forbes*. Liverpool (near the Dingle), *Mr. Merrick*. Still at Hulme Stone Quarry (otherwise called Winwick Stone Delph), near Warrington, where Bolton gathered it (*v. Bolt. Fil. loc. cit.*), *Mr. W. Wilson*. In this place *Mr. Shaw*, of Bollington, many years ago found a curious variety, with a much more divided frond than is usual, and which remains with him distinct in culture.—WAL.: Anglesea, *Mr. J. E. Bowman*. Near the South Stack Light-house, Holyhead, *Mr. C. C. Babington*. Ormeshead, and near Bangor, *Mr. W. Wilson*.—SCO.: Parish of Nigg, Rosshire, *Mr. Brichan*. Near Port Patrick, Wigtons, *Dr. Balfour*. Moray, *Rev. G. Gordon*. Isle of Staffa, *Mr. J. Doraston*. Near Eyemouth, Berwickshire, *Rev. A. Baird*. Fife and Aberdeenshire, (common,) *Dr. Murray*. Isle of Arran, *Mr. T. H. Cooper*.—IRE.: Sutton side of Howth Mountain, Underwood, Killiney Hill, &c. *Dr. Osborne*. Derriane, county Kerry, *Mr. Kelly*. Abundant on the Southern and Western coasts, *Mr. Mackay*.

GEO.—Barbary, Canary Islands, Spain, St. Helena, West Indies, Islands of the Archipelago, &c. There is but little difference between our plant and *Dr. Hooker's* species *Asplenium Obtusatum*.

#### 4.—ASPENIUM TRICHOMANES.

COMMON MAIDEN-HAIR SPLEENWORT. WALL SPLEENWORT.

(Plate 3, fig. 4.)

CHA.—Frond pinnate, linear. Pinnæ subrotund, crenate. Rachis black.

SYN.—*Asplenium trichomanes*, *Linn.*, *Willd.*, *Michx.*, *Woodv.*, *Bolt.*, *Dicks.*, *Ehrh.*, *Lightf.*, *Smith*, *Hook.*, *With.*, *Spreng.*, *Huds.*—*Asplenium saxatile*, *Salisb.*, *Gray.*—*Asplenium Trichomanoides*, *Schkr.* (not *Michx.*)—*Asplenium Melanocaulon*, *Willd.*, *Pursh.*—*Trichomanes*, *Ray*, *Fuchs.*, *Tillands.*, *Bauh.*, *Plum.*, *Sibb.*, *Park.*—*Phyllitis rotundifolia*, *Moench.*

FIG.—*E. B.* 576.—*Flo. Lon.* 156.—*Bolt.* 13.—*Flo. Dan.* 119.—*Woodv.* 204.—*Ger.* 1146.—*Plum. t. B.* f. 1.

DES.—Fronds tufted, linear, pinnate, 2 to 4 inches high, dark green, very rigid, quite smooth, with a purplish-black shining rachis, channelled in front. Pinnæ from 20 to 30 pairs, opposite or alternate (generally the former), obtuse, crenate, of a round or oval form, very distinct from each other all the way up, and sessile, or very nearly so. Sori two to six on each pinna, placed transversely. very dark coloured, finally confluent, often covering the whole under surface.

HAB.—Common on rocks, old walls, &c. in most parts of the United Kingdom, not only on the main land, but the Isles of Anglesea, Man, Wight, Sheppy, and the Channel Isles, yet by no means frequent in the E. and N.E. of Scotland.

GEO.—Throughout Europe. In Jamaica. In Japan and other parts of Asia. Canada, Pennsylvania, and high mountains of Carolina.

## 5.—ASPLENIUM VIRIDE.

GREEN MAIDEN-HAIR SPLEENWORT. GREEN RIBBED SPLEENWORT.

(Plate 3, fig. 5.)

CHA.—Fronde pinnate, linear. Pinnæ roundish-deltoid, erenate. Rachis green.

SYN.—*Asplenium viride*, *Huds.*, *Willd.*, *Roth*, *Dicks.*, *Ehrh.*, *Bolt.*, *Smith*, *Hook.*, *With.*, *Spreng.*, *Galp.*, *Lightf.*, *Gray*.

FIG.—*E. B.* 2257.—*Bolt.* 14.—*Flo. Dan.* 1289.—*Pluk. Phy.* 89, f. 6.

DES.—Fronde numerous, pinnate, linear, from 3 to 6 inches high, of a very light green color. Pinnæ petioled, alternate, the upper ones ovate, the lower roundly triangular, attached to the rachis by the centre of one of the sides, which is somewhat truncate, the other two sides being regularly and deeply erenate, sometimes doubly so. Rachis quite green, except at the lower part. Sori reddish brown, two to six on each pinnæ, confined to the middle of it, finally becoming confluent, but even then not extending to the margin.

This is immediately distinguished from the last by the lighter colour of all its parts, less spreading sori, and differently shaped and alternate pinnæ, added to which the pinnæ on the lower part of the frond are generally distant, and those near the top of the frond crowded, while the whole is very delicate and elegant. Sometimes the frond is divided into two, as represented in Bolton, t. 2, f. 3, when it becomes the *Trichomanes ramosum* of authors; but this branching is an accidental circumstance, and by no means constant, it therefore does not constitute a variety, more especially as not more than two or three branched fronds are found upon a plant, all the rest being of the common character and appearance.

SIT.—On rocks, not farther south than Yorkshire, perhaps Derbyshire.

HAB.—ENG.: Near Ais-la-Beck, and Richmond, Yorks., *Mr. J. Ward*. On rocks in Northumberland, *Mr. Winch*. Mazebeck Sears, Westmorl., Falcon Clints, Teesdale, and Gordale, Yorkshire, *Mr. R. Bowman*. Near Halifax, Yorkshire, *Mr. R. Leylands*.—WAL.: Cader Idris, *Mr. J. E. Bowman*. Snowdon, *Mr. C. C. Babington*. Twll Du, Caern., *Mr. T. H. Cooper*. Not uncommon on the Welch mountains, *Mr. W. Wilson*.—SCO.: Higher Tees, *Mr. J. Hogg*. Rosshire, *Rev. G. Gordon*. Cawder Woods, Nairns., *Mr. W. Staples*. Base of Benmore, Sutherlandsh., *Dr Johnston*. Far too common in the Highlands to need the specifying of stations, *Mr. H. C. Watson*.—IRE: Turk Mountain, Killarney, Ben Bulbin, county of Sligo, and on the Donegal mountains near Lough Eske, *Mr. Mackay*.

GEO.—Germany, Holland, Switzerland, France, very rare, except on the mountains of Tyrol and Carinthia.



## 6.—ASPLENIUM RUTA-MURARIA.

WALL RUE. RUE-LEAVED SPLEENWORT. TENTWORT.

(Plate 3, fig. 6.)

CHA.—Frond bipinnate, Pinnæ alternate. Pinnules ovate or wedge-shaped, with rounded notched extremities.

SYN.—*Asplenium Ruta muraria*, Linn., Willd., Hook., Smith, Bolt., Bull., Ehrh., Huds., With., Galp., Lightf.—*Asplenium murale*, Bernh., Gray. *Scelopendrium Ruta muraria*, Roth.—*Phyllitis Ruta Muraria*, Moench. *Ruta muraria*, Bauh., Ray., Ger., Plum.

FIG.—*E. B.* 150.—*Bolt.* 16.—*Fl. Dan.* 190.—*Bull. Fr.* 195.—*Plum. Fil.* t. A. f. 3.

DES.—Root tufted, black, very long. Frond from one to four inches high, dull green. Rachis green except at the very base. Pinnæ confined to the upper half, from three to five or six in number, placed alternately, for the most part distinctly, three cleft. Pinnules ovate in small fronds, wedge shaped in the larger, their tips rounded and erenate or unequally notched. Barren fronds broader and shorter. Sori dark brown, finally confluent, and covering the whole under surface. Indusium uneven at the margin.

SIT.—On walls, ruins, rocks, and other similar situations.

HAB.—Very generally distributed over the United Kingdom, though there are a few districts where it is scarcely found. I believe Berwickshire is one of these, nor is it by any means plentiful in Norfolk or Suffolk.

GEO.—Most parts of Europe, and from New York to Carolina in America.

## 7.—ASPLENIUM FONTANUM.

SMOOTH ROCK SPLEENWORT.

(Plate 3, fig. 7.)

CHA.—Frond bipinnate. Pinnæ oblong, blunt, alternate. Pinnules wedge-shaped, cleft, and toothed. Rachis winged.

SYN.—*Asplenium fontanum*, Hook., Smith, Bernh.—*Aspidium fontanum*, Willd., Swz., (not of Schkr.)—*Polypodium fontanum*, Linn., Huds., Bolt., With.—*Athyrium fontanum*, Gray.

FIG.—*E. B.* 2024.—*Lob. Ic.* 810, 1.—*Bolt.* 21 (bad).

DES.—Root tufted, long, black. Frond laneeolate, bipinnate, evergreen, 2 to 6 inches high. Rachis winged throughout. Pinnæ alternate, ovate, oblong, those in the middle of the frond from a quarter to half an inch long, formed of six or eight pinnules placed alternately. Pinnules short, broadly wedge-shaped, petioled, so very deeply cleft at the sides and toothed at the apex, as to become nearly pinnate. Seldom more than two sori upon each pinnule, which soon extend over the whole surface of it.



Our present species most resembles the last, the shape of the frond being nearly the same. The Fontanum, however, is much more delicate, and smaller in all its parts, of a very dark green color, its pinnales not half the size and of a very different shape to those of the Lanceolatum, besides which its winged rachis is of itself a sufficient diagnostic. It is very much more difficult to distinguish it from Asplenium Halleri, a species that is very rare on the Continent, and for which our Fontanum is very generally sold.

HAB.—Supposed to be now extinct in England; it was once found on Amer-sham Chureh, in Buckinghamshire, and at Wybourn, in Westmoreland. I have been informed that living plants were found at a waterfall in either Northumberland or Westmoreland, 10 or 12 years ago, and also that it once grew on Alnwick Castle; but if so, it is no longer found there.

GEO.—Saxony, Switzerland, South Europe, and Siberia.

## 8.—ASPLENIUM ADIANTUM NIGRUM.

BLACK MAIDEN-HAIR. SHINING SPLEENWORT.

(Plate 3, fig. 8.)

CHA.—Frond tripinnate, subdeltoid. Pinnæ alternate. Pinnules inciso-serrate, blunt. Rachis winged, black.

SYN.—Asplenium Adiantum nigrum, *Linn., Willd., Smith, Hook., Mack., Bolt., Roth, Huds., With., Galp., Bernh., Lightf.*—Asplenium lucidum, *Gray, Salisb.*

FIG.—*E. B.* 1950.—*Flo. Dan.* 250.—*Bolt.* 17.—*Ger.* 1137.

DES.—Frond tripinnate, ovate or deltoid, 4 to 8 inches high, dark green, rigid and erect. Rachis black, smooth, slightly winged, clothed with pinnæ only on the upper half. Pinnæ alternate, those only on the lower part twice pinnate, the lowermost the largest. Pinnules deeply cleft, tapering at their base, sharply serrated at and near the top. Sori linear at first, round at last, covering the whole under surface of the frond.

α Fronds rigid, tripinnate only at the lower part. (*The common plant*).

β Fronds delicate, tripinnate throughout. (*Not β of Smith.*)\*

Sir J. E. Smith, in conformity with the old authors, makes another variety, differing only from the common plant in having long fronds and distant pinnæ, but I leave any one to say if it be anything more than a drawn up plant of the common species, found as it was, solitary, in a dark cave.

HAB.—α: Common through the United Kingdom, on walls, rocks, &c. I have habitats from the Orkney Islands, and from those in the English Channel, from the Eastern as well as from the Western counties, from Wales, Scotland, and Ireland. Dr. Murray writes me, "Not common in the north of Scotland." —β: Limestone rocks at Mucruss, Killarney, *Mr. Mackay, Miss Hutchins,* and *Dr. Taylor.* Mount Cahir-Courcee, six miles from Tralee, *Mr. W. Andrews.*

GEO.—Italy, France, Germany, Madeira, and high mountains of Carolina.

\* Mr. J. Beevis informs me that the late Dr. Emerson (who resided near Tunbridge), found some years ago what he considered a multifid variety of this plant, under a rock in Staffordshire. He had 8 or 9 fronds, one of which I have a part of, and have represented a lower pinnule of one of the lower pinnæ in the last plate. The plant is so curious and beautiful as to be worth the search. It is very different from the Irish variety.

## 9.—ASPLENIUM LANCEOLATUM.

LANCEOLATE SPLEENWORT.

(Plate 3, fig. 9.)

CHA.—Fronde lanceolate, bipinnate. Pinnæ and pinnules obovate, sharply toothed at the apex.

SYN.—*Asplenium lanceolatum*, Huds., Swz., Hoffm., Willd., Smith, Hook., Forst., With., Galp., Gray.—*Phyllitis lanceifolia*, Moench.

FIG.—*E. B.* 240.—*Ger. Herb.* 1135.

DES.—Fronde lanceolate, bipinnate, from 3 to 6 inches high, upright in habit, and of a light green color. Rachis green, minutely hairy, not winged, void of pinnæ below. Pinnæ opposite, from 12 to 20 pairs, the lower pair short, distant from the next, and often slightly drooping. Pinnules ovate, sharply serrated and pointed, the smaller confluent, the larger petioled and tapering at the base, particularly that on the upper side next the rachis. Sori light brown, one or two near the middle of each lobe, at first linear, afterwards round, but very rarely or never covering the whole under surface.

This fern has been repeatedly confounded with *Asplenium Adiantum Nigrum*, though there is so great a dissimilarity between them; our present species is of a different shape, color, size and habit, its divisions less numerous, the naked part of its stem shorter, and its sori less extended: in fact they vary in almost every particular.

SIT.—On rocks, &c. in the south of England, and in Wales.

HAB.—On the walls of the Church of St. Saueret, near the Land's End, Cornwall, *Mr. Jones*. Abundant around Penzance and St. Ives, *Mr. H. C. Watson*. Scilly Islands, *Mr. W. C. Trevelyan*. Sussex, *Mr. Borrer*. High rocks near Tunbridge Wells (1835), *Mr. W. Pamplin*. Near Barmouth (plentiful), *Mr. J. E. Bowman* and *Mr. W. Wilson*.

GEO.—Azores, Bohemia, Hungary, France.

## 10.—ASPLENIUM FILIX-FÆMINA.

LADY FERN.

(Plate 3, fig. 10.)

CHA.—Fronde broadly lanceolate, bipinnate. Pinnæ tapering, pointed. Pinnules oblong, inciso-serrate. Rachis smooth.

SYN.—*Asplenium Filix-fæmina*, Hook., Mack., Spreng., Bernh.—*Aspidium Filix-fæmina*, Swz., Willd., Smith, Hook. in *Fl. Sco.*, Galp.—*Polypodium Filix-fæmina*, Linn., Lightf., Huds., Bolt., Dicks., With.—*Polypod. ovato-crenatum*, Hoffm.—*Athyrium Fil.-fæm.*, Roth, Decan.

FIG.—*E. B.* 1459.—*Fl. Dan.* 1346.—*Bolt.* 25.—*Pluk. Phyt.* 180, f. 4.

DES.—Root large, tufted. Rachis without scales, green (rarely purple), the naked part very short. Frond bipinnate, broadly lan-

ceolate, long-pointed, and tapering at the base, 12 to 20 inches high, dark green, very delicate in habit, often recurved. Pinnæ alternate, from 20 to 40 pairs, oblong, tapering gradually to a point, the lower ones sometimes drooping. Pinnules very numerous, oblong, rather blunt, pinnatifid, or inciso-serrate, the serratures minutely toothed, but not aristate, the lower pair close to and parallel with the rachis. Sori solitary, near the base of the lobes, at first linear-reniform, at length round, but not confluent. Indusium jagged, white, oblong or reniform.

β Rachis red and somewhat sealy. (This is the character the plant bears in Switzerland.)

γ (*Aspid. Irriguum*, Sm.) Frond narrow, pinnæ distant and tender.

δ Frond broad and small, pinnæ and pinnules short and few, nearly white.

All the varieties of this Fern are so very tender (particularly the var. γ), that they shrivel up and become withered almost immediately upon being gathered. Under the name of *Aspidium Irriguum*, I have received fronds (without fruit) of very different habit, marked γ and δ, neither of them by any means a distinct species, perhaps not even a constant variety, as the former appears to me rather a plant drawn up either by a confined situation or excess of moisture, while the other is perhaps a young plant only, and its very light color an adventitious circumstance. The beauty of this common plant occasioned its name of Lady Fern, contrasting as it does with the robust habit of *Filix Mas* or Male Fern.

SIT.—Its natural habitation is swampy woods and damp hedge-rows, or, as Sir Walter Scott incidentally remarks in his novel of *Waverley*,—

“ Where the copse-wood is the greenest,  
Where the fountain glistens sheenest,  
Where the morning dew lies longest,  
There the Lady Fern grows strongest.”

HAB.—Pretty freely distributed over the Southern and Midland Counties of England and Ireland, though it is by no means abundant in North Wales or North Scotland, except in particular neighbourhoods.—β: Frequent in moist woods in Kent, *Mr. W. Pamplin*.—γ: Rubens Law, Jedburg; Aber, Caern.; and near the English Bridge, Shrewsbury, *Mr. Leighton*. Marsh at Mucruss, Killarney, *Mr. Mackay*. In some boggy woods belonging to Eridge Park, Tunbridge Wells (1835), *Mr. W. Pamplin*.—δ: Prestwich Carr, near Manchester, *Mr. Merrick*, who gave me a specimen (5 inches high).

GEO.—Throughout Europe, and from Canada to Virginia, in North America.

## SCOLOPENDRIUM, Swz. HART'S-TONGUE.

(The sori are shaped like the feet of a Scolopendra.)

### PLATE OF GENERA, FIG. VII.

*The sorus of this small genus appears to have two indusiums, at first folded over each other, and afterwards thrown back in contrary directions; but in fact the sorus is no less double, two of them growing together so closely as to form in appearance but one mass, this is transverse, and seated between those lateral veins to which the two covers are attached.*



## SCOLOPENDRIUM VULGARE.

COMMON HART'S-TONGUE.

(Plate 3, fig. 11.)

CHA.—Frond ligulate, acute, entire, cordate at the base. Rachis scaly.

SYN.—*Scolopendrium vulgare*, *Smith*, *Hook.*, *Spreng.*, *Mack.*, *Gray.*—*Asplenium scolopendrium*, *Linn.*, *Huds.*, *Bolt.*, *Woodw.*, *Ehrh.*—*Asplenium elongatum*, *Salisb.*—*Scolopendrium officinarum*, *Swz.*, *Willd.*, *Pursh.*—*Scolopendrium Phyllitis*, *Roth.*

FIG.—*E. B.* 1150.—*Bolt.* 11.—*Flo. Lon.* 67.—*Ger.* 1138.—*Schk. fl.* 83.

DES.—Root tufted. Fronds numerous, a foot high, strap-shaped, pointed, the base of them heart-shaped, smooth, except the rachis and the lower part of the midrib, which are very scaly. Sori attached to oblique transverse veins, always in twin united masses, each having its cover attached, the one at the upper side, the other at the lower, and when young folding over each other in the middle. The sori are oblong, distant from each other, and chiefly at the upper part of the frond.

This plant is very apt to run into differently cleft and crisped varieties, which remain constant under cultivation, and bear fruit copiously in that state; even the common plant has often some of its fronds cleft at the extremity.

$\alpha$  (*vulgare*). Frond ligulate, flat-pointed.

$\beta$  (*crispum*). Frond crisped and curled.

$\gamma$  (*multifidum*). Frond much cleft at the top.

Sir J. E. Smith remarks that the whole plant has a nauseous scent when bruised, and is of a mucilaginous and acid taste. It is now discarded from the regular practice of medicine, but frequently still sold in our herb shops, being used as an ointment for burns, &c., and taken internally as an astringent.

SIT.—In damp ruins, rocks, wells, &c.

HAB.—Scarcely a common Fern, though abundant in some places, particularly in the South and West of both England and Ireland, but decreasing in quantity northwards. Isle of Man, *Mr. C. Forbes*. Near Braunston, Leicestershire (rare), *Rev. A. Bloxam*. In Wagg Lane, Congleton, Cheshire, also at Buxton, Matlock, and Dove Dale, Derbyshire, *Mr. H. C. Watson*. Near Leeds, *Mr. H. Denny*. Near Richmond and Settle, Yorkshire, *Mr. J. Tatham*. Pease Bridge, Durlham, *Mr. Winch*. Three varieties on Pottery Car, near Doncaster, *Mr. Appleby*. Hawkstone, Salop, *Mr. J. S. Bayly*. Abundant about Twickenham, Whitton, Hounslow, Brentford, &c., Middlesex; also at Barnes Common and Windledon Common, Surrey. Near Wrexham, Denb., *Mr. J. E. Bowman*. Arniston Woods, Edinburgh, *Mr. W. Brand*. Cawdor Woods, *Mr. W. Stables*. Moray, *Rev. G. Gordon*. Tees, *Mr. J. Hogg*. Sutherland, Aberdeenshire, and Kincardineshire, but by no means common, *Dr. Murray*. Orkney, *Dr. Gillies*. Castell Aber, Lleiniog, Anglesea, *Mr. W. Leighton*.— $\gamma$ : Caernarvon Castle, *Mr. J. F. M. Dovaston*. Carreg Onau, Anglesea, *Mr. W. Leighton*.

GEO.—Not found in the Northern countries of Europe. In Germany as far North as Grinnia. Very rare in North America, being, according to Pursh, found only in one place, viz. New York.



## PTERIS, Linn. BRAKES.

(πτερίς, a Fern, from πτερίξ, a Feather.)

## PLATE OF GENERA, FIG. IX.

A very extensive genus, comprising no less than 120 species, most of them from warm climates. One species only is British. The fructification is borne in a continued line along the margin of the frond, which being turned over forms a continued indusium; an inner indusium is also present in ours and some other species, which many Botanists consider a necessary character of a *Pteris*, and that its absence or presence might serve to divide the genus into two.

## PTERIS AQUILINA.

BRAKES. BRACHEN. FEMALE FERN.

(Plate 3, fig. 12.)

CHA.—Frond thrice pinnate. Larger pinnules pinnatifid, smaller entire. Rachis smooth.

SYN.—*Pteris Aquilina*, Linn, and all modern Authors.—*Filix fœmina*, Ray, Ger.—*Asplenium aquilina*, Bernh.—*Pteris caudata* β, Schk.

FIG.—*E. B.* 1679.—*Ger.* 1128.—*Bolt.* 10, (all bad).

DES.—Root long and creeping. Rachis smooth, shining, without pinnae on the lower half, tapering and black near its junction with the root. Fronds deciduous, erect, rigid, repeatedly divided, 2 to 5 feet high. Pinnae opposite, more and more divided downwards, the smallest entire, the next pinnatifid, still lower ones pinnate, pinnato-pinnatifid, and twice-pinnate. Pinnules opposite below, alternate above, oblong, blunt, connected to the midrib by their whole base, that terminating the pinna much larger than the others near it. Sori in a continued line around every sinuosity of the pinna. Cover the margin of the frond reflexed, within which, according to Mr. T. Smith, F.L.S., and Mr. Brown, is another cover, contrary or opposite to the outer one, and in like manner fringed. When the young fronds first uncoil themselves, they are densely downy.

If the stem be cut across near the root, it exhibits the bundles of vessels very plainly, in the form of an oak tree, or, as Linnæus thought, a spread eagle, hence its name *Aquilina*. Young plants of this species are extremely delicate and beautiful, very different in character and appearance to the full-grown plant.

VIR.—This Fern is useful for many purposes independently of the anthelmintic and astringent properties the herbalists attach to it. It is the favorite haunt of the deer tribe. As it is very long before it rots, and does not harbour insects, it is excellent as thatch; it does not hold moisture so much as straw, and is therefore better as litter for cattle, and as a cover to preserve plants from frost. It is also very excellent to lay fruit upon, or to pack it in, as it does not communicate any mustiness. Containing tannin, it is useful in the

preparation of the lighter kinds of leather, and affords excellent potash when burnt. Its harsh texture and astringent taste render it unpalatable to cattle, though the roots are sought for by pigs, and have even been dried and ground for bread, but only in times of the greatest scarcity. The peasants of most parts of the kingdom assert their right to it as fuel, and use it chiefly to heat their ovens, a purpose for which it is well adapted, as it burns furiously. It is so valuable to the farmer of Germany for cattle fodder, that it is an article of ready sale there, and the cutting of it subject to very severe forest laws.

Sr.—Upon barren heaths, in parks and woods, contenting itself occasionally with any soil or situation; it delights, however, in sand and strong loam, while it shuns the limestone and chalk districts; thus, if I recollect rightly, it is scarcely found on Salisbury Plain, nor do I remember meeting it any where in Kent except in sandy spots. Be it observed, however, that it is not wholly excluded from chalk and limestone, as I have seen it occasionally on both. It is not fond of a lofty nor much exposed situation, as, according to Mr. Watson, it is not found in places more than 500 or 600 yards above sea level.

Geo.—Generally distributed over Europe, and in North America. The American species varies a little from ours, being rather more finely divided, somewhat ciliated, and earlier in growth.

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### CRYPTOGRAMMA, Br. ROCK-BRAKE.

(From κρυπτος, covered, γραμμα, a line, from the concealed lines of sori.)

PLATE OF GENERA, FIG. X.

Our only plant was long considered a *Pteris*, because, although very different in habit, it has, like that genus, its fruit situated near the edge of the frond in an apparent continued line, the reflexed edge forming its cover. It differs, however, in having its sori in lines along the transverse veins, and not merely at the termination of them, also not continued along all the undulations of the whole frond, but confined to the separate lobes.

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### CRYPTOGRAMMA CRISPA.

ROCK-BRAKE. STONE-FERN. CRISPED-FERN. PARSLEY-FERN.

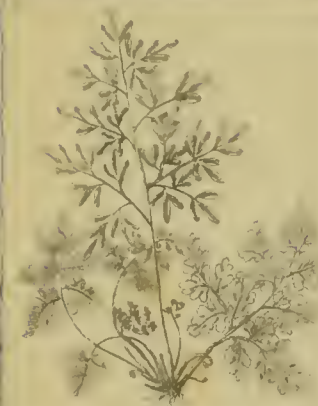
(Plate 4, fig. 1.)

CHA.—Frond thrice pinnate. Fertile pinnules oblong, blunt; barren ones cuneiform, cleft, crenate.

SYN.—*Cryptogramma crispa*, Hook. in *Br. Fl.*, Mack.—*Pteris crispa*, Linn. MSS., Willd., Swz., Hull, With., Smith, Hook. in *Fl. Sco.*,—*Osmunda rupestris*, Salisb.—*Osmunda crispa*, Linn. in *Sp. Pl.*, Huds., Lightf., Bolt.—*Stegania onocleoides*, Gray.—*Onoclea crispa*, Roth., Hoffm.—*Allosorus crispus*, Bernh., Kaulf., Spreng.

FIG.—*E. B.* 1160.—*Bolt.* 7.—*Flo. Dan.* 496.—*Pluk. Phyt. t.* 3, f. 2.

DES.—Root slightly creeping, long and fibrous. Frond thrice pinnate, deciduous, of a very lively green color, 3 to 12 inches high. Rachis slender, smooth, and shining. Barren pinnules wedge-shaped or roundish, deeply cut and crenate, pinnæ nearly opposite, but not always so, 4 or 5 pairs. Fertile fronds taller and more robust







than the barren ones, their pinnæ more inclined to be alternate, pinnules oblong, elliptic, blunt, their crenate sides turned over upon the sori, which are in lines along each side of the lobe, distinct only for a very short time at first, then very confluent and crowded.

SIT.—Southey calls this plant the “Mountain Parsley,” an appellation which well expresses its tender habit, its delicate, lively color, and its numerous, finely cut, and crisped leaves. Covering large patches as it sometimes does on the tops of rocky mountains, it adds a bright gleam of verdure and of beauty to its romantic but barren dwelling place, and becomes an oasis of rich fertility upon the precipitous face of a sterile rock.

HAB.—From 200 yards upwards to a considerable elevation in Caernarvonshire (top of Snowdon). In Cumberland from 200 or 300 yards to 1040 yards. In the Highlands, from the low valleys to 1100 yards on Ben-na Baird. More common in the lake district of England than in Scotland, but frequent in several parts of the latter, *Mr. H. Watson*. Breiddon Hill (12 miles west of Shrewsbury), *Mr. J. E. Bowman*. Greenfield, Saddleworth, *Mr. J. Merriek*. Common about Settle, Yorkshire, *Mr. J. Tatham*. Skiddaw, Helvellyn, Saddleback, Grassmoor, Vale of Newlands, &c., Cumberland, *Mr. H. Watson*. On rocks at the foot of Cheviot, above Langley Ford, *Mr. Winch*. Near Lancaster, *Mr. W. Wilson*.—WAL.: Mount Glyder, Mount Snowdon, and Mynydd Mawr, Caernarvonshire, *Mr. C. C. Babington*. Cader Idris, *Mr. Purton*. North Wales (abundantly), *Mr. W. Christy*.—SCO.: Higher parts of the Tees, *Mr. Hogg*. Rosshire, *Rev. G. Gordon*. Glen Tilt and Blair Athol, Perthshire, *Mr. W. Brand*. Not rare in Sutherland, *Dr. Murray*.—IRE.: Abundant on the Mourne Mountains, *Mr. Mackay*.

GEO.—Lapland, Germany, Switzerland, Pyrenees, Silesia, Sweden, Jutland, Norway, Dauphiny, Holland.

## BLECHNUM, Linn. HARD FERN.

(From βλήμων, a Greek name for a Fern.)

### PLATE OF GENERA, FIG. VIII.

A genus of 31 species, known by bearing its fruit in closely united masses, not on transverse veins, as in *Scolopendrium*, but one on each side, and close to the midrib of the pinnule. Covers attached on the outer side of each mass, opening on the inner side, but not folding over each other, as in the last genus. Our plant is properly a *Lomaria*, both in structure and in habit, and not a *Blechnum*, as its sori are really marginal, and only appear to be annexed to the midrib in consequence of the linear character of the pinnules of the fertile frond.

## BLECHNUM BOREALE.

HARD FERN. ROUGH SPLEENWORT.

(Plate 4, fig. 2.)

CHA.—Frond pinnate, erect. Pinnæ linear, entire. Rachis smooth.

SYN.—*Blechnum boreale*, Swz., Willd., Spreng., Smith, Hook. Mack., Galp., Gray.—*Blechnum spicant*, Roth.—*Osmunda spicant*, Linn., Bolt., Hedw., Ehrh., Lightf.—*Osmunda borealis*, Salisb.—*Lonchitis aspera*, Ray, Ger.—*Acrostichum nemorale*, Lam. Fl. Fr.—*Acrostichum spicant*, Sibth., Vill.—*Asplenium spicant*, Bernh.—*Onoclea spicant*, Hoffm.—*Lomaria spicant*, Desv.

FIG.—E. B. 1159.—Bolt. 6.—Flo. Dan. 99.—Ger. 1140.—Schk. fl. 110.

DES.—Root black, tufted, scaly, with stout fibres. Rachis smooth

and polished. Fertile fronds numerous, erect, strap-shaped, tapering at each end, about a foot high. Pinnæ linear, dilated somewhat at the base, in some degree falcate, distant from each other, and alternate, wholly covered on the under side with fruit. Barren fronds lanceolate, shorter than those which are fertile, and growing more on the outside of the plant, their pinnæ oblong, curved upward, and placed close together at their bases, but scarcely dilated at that part. Sori continued in an uninterrupted line from the base to the point of each pinna, one on each side of the midrib. Indusium attached to the edge of the pinna, opening on the side nearest the midrib.

While young the back of the lobe shows only the midrib and two irregularly edged, white covers; afterwards they bend back and turn brown, and as in our species no leafy expansion appears outside the line of thecæ, but the cover seems to be the edge of the frond reversed, it might be taken at first sight for a *Pteris*.

SIT.—On sandy heaths, hedge-rows, stony places, &c.

HAB.—Spread throughout England, Scotland, and Ireland, in the last country especially in the counties of Wicklow and Clare. It ascends to 700 yards in Cumberland, 800 in Forfarshire, and much higher on the Cairngorum Mountains, in Aberdeenshire, where it probably attains to situations of the height of 1200 or 1300 yards.

GEO.—Common in Germany, Denmark, Norway, Sweden, and N.W. coast of America.

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## ADIANTUM, Linn. MAIDEN-HAIR.

(From *αδιντος*, against, and *διαντα*, moisture, the plants never being wet.)

### PLATE OF GENERA, FIG. II.

*A very beautiful, delicate, and interesting genus of 63 species, indigenous to the southern countries of Europe and the Tropical regions, this country being the northern limit of them all. The sori are arranged in spots along the margin of the pinnules, and covered by part of the frond reflexed.*

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## ADIANTUM CAPILLUS-VENERIS.

### TRUE MAIDEN-HAIR.

(Plate 4, fig. 3.)

CHA.—Frond twice pinnate. Pinnules alternate, cuneiform. lobed, on capillary petioles. Indusium oblong.

SYN.—*Adiantum Capillus-veneris*, Linn., Willd., Smith, Bolt., Dicks., Hook., Mack.—*Adiantum capillus*, Swz.—*Adiantum Fontanum*, Salisb., Gray.  
—*Adiantum coriandrifolium*, Lam.—*Capillus veneris verus*, Dill. in Ray's *Syn.*, Ger.

FIG.—*E. B.* 1564.—*Bolt.* 29.—*Jacq. Misc. t. 7.*—*Ger.* 1143 (bad).

DES.—Root slightly creeping and very hairy. Rachis slender,

shining, rigid, purplish-black, without pinnæ on the lower part. Pinnæ alternate, in young fronds lobed only, afterwards pinnate. Pinnules wedge-shaped, crenate or cleft at the top, alternate. Sori marginal, in spots, one near the end of each lobe of the pinnule, the apex of which is turned over, forming a white, oblong cover, to which the fruit itself is attached.

The manner of the expansion of this plant is very singular and interesting. The young frond is but slightly circinate in veneration, appearing at first with only one or two small, wedge-shaped pinnules; after a time these split into lobes, which lobes become wider, long-stalked, and detached from each other, forming separate wedge-shaped pinnules exactly similar to those from which they were detached, and if the plant be luxuriant, these again divide in a similar manner; thus some fronds are found pinnate, others twice, and sometimes thrice pinnate. The whole plant forms an interesting object for the microscope, particularly the membranous indusium, which is beautifully veined. The ring of the theca also is very different from that of any other British Fern. (*See plate of Genera.*)

VIR.—The properties of *Adiantum* are very uncertain. Its use is said to give name to the syrup *Capillaire*. It has neither fragrance nor flavor, and when boiled yields only a little mucilage.

HAB.—Port Kerig, Glamorganshire (verified 1834). Banks of the Carron, a rivulet in Kincardineshire, *Professor Beattie*. In a small cave on the east side of Carraich Gladden, a cove on the north coast of Cornwall, between Hayle and St. Ives, *Professor Henslow*. Isles of Arran, county of Galway, *Dr. Osborne*. At Wrisbeg, on a rock facing south-west on the shore of Loch Bulard, *Mr. C. C. Babington*.

GEO.—South Europe, Isles of Bourbon, Teneriffe, Jamaica, & Hispaniola.

## HYMENOPHYLLUM, Swz. FILMY FERN.

(*υμεν*, a membrane, *φυλλον*, a leaf; or the membranous-leafed Fern.)

PLATE OF GENERA, FIG. X.

*In this small and delicate genus, a lobe of the pinna is contracted into the fruit and its receptacles, the lamina of the lobe forming two valves, enclosing between them the midrib, to near the end of which are attached several ringed and petioled thecæ, the annulus of which does not coincide with the petiole.*

### 1.—HYMENOPHYLLUM TUNBRIDGENSE.

TUNBRIDGE FILMY-FERN.

(Plate 4, fig. 4.)

CHA.—Frond pinnate. Pinnæ pinnatifid, erect. Lobes serrated. Rachis winged. Involucre orbicular, serrated at the top.

SYN.—*Hymenophyllum Tunbridgense*, *Smith*, *Willd.*, *Hook.*, *Mack.*, *Swz.*, *Gray*.—*Trichomanes Tunbridgense*, *Linn.*, *Huds.*, *With.*, *Bolt.*, *Lightf.*—*Trichomanes pulchellum*, *Salisb.*

FIG.—*E. B.* 162.—*Hook.* in *Flo. Lon.* 71.—*Bolt.* 31.—*Flo. Dan.* 954.—*Hedw.* 3.—*Forst* in *Flo. Tonb.* (excellent.)

DES.—Root black, fibrous, hairy, extensively creeping, rather



upon than under the surface of the ground. Rachis naked on the lower part, capillary, black, broadly winged all the way down. Fronds solitary, at intervals along the creeping stem or root, one to two inches high, of a light green colour. Pinnæ alternate, growing quite upright, their veins dichotomously branched. Lobes sharply serrated or toothed, linear and blunt pointed, running into each other, and seated chiefly on the upper side of what may be called the midrib of the pinna, but not wholly confined to that side, as in the next species. Receptacles formed from and in the place of the last lobe, on the upper side of each pinna; thus they appear in two rows, one on each side of the rachis. The receptacle is composed of two flat or slightly convex, roundish valves, folding over each other, and sharply serrated at the points; between which is a free column covered with thecæ.

SIT.—On damp, shady rocks, generally among moss.

HAB.—On the moist and shady sides and fissures of the various rocks near Tunbridge Wells, viz. the High Rocks, and the rocks in Eridge Park (abundant, 1835), *Mr. W. Pamplin*. Clefts of the rocks at Wistman's Wood, Dartmoor, rocks by Dunsford Bridge, Becky Fall, &c., Devon, *Flo. Dev.* Greenfield, near Saddleworth (very rare), *Mr. W. Wilson*. Near Halifax, *Mr. Leyland*. Near Cader Idris and Dolgelley, *Mr. Bowman*. Very abundant and fine near the Upper Lake Killarney, *Mr. W. Wilson*. Powerscourt Waterfall, Glenree, and other places in the county of Wicklow, *Mr. Mackay*.

GEO.—This and probably the next species are scattered over Europe from Italy to Norway.

## 2.—HYMENOPHYLLUM WILSONI.

NORTHERN FILMY-FERN. SCOTTISH FILMY-FERN.

(Plate 4, fig. 5.)

CHA.—Fronde pinnate. Pinnæ semipinnatifid, recurved. Lobes serrate, Rachis not winged. Receptacle ovate, entire.

SYN.—*Hymenophyllum Wilsoni*, *Hook.* in *Br. Flo.*,—*Mack.*

FIG.—*E. B.*, suppl. 2686.

DES.—Rachis rigid, capillary, winged at the top. Frond one or two inches high, dark green. Pinnæ alternate, bent backwards, growing horizontally rather than vertically as in the last species, besides which the lobes curve downwards, so that when the edge of them is looked at, they have a falcate appearance, although they are oblong and blunt, and it may be added, very sharply serrated. When in fruit, all the leafy expansions turn in one direction, and the fruit in the opposite. The receptacles are situated as in the last species, but are larger, very convex, perfectly ovate, and entire.

The absence of wings to the rachis, the different habit, the semi-pinnatifid character of the pinnæ, and the entire, convex receptacle, serve to distin-



gnish this from *Hymenophyllum Tunbridgense*, with which it was confounded, until shown to be distinct by that accurate botanist, Mr. W. Wilson.

SIT.—On moist alpine rocks, near waterfalls, &c.

HAB.—Waterfall above Ambleside, Westmorland, *Mr. J. Bowerbank*. Black Rocks of the Great End, in the Seawfell range, and at Scale Force, near Buttermere, Cumberland (1833), *Mr. H. Watson*. Greenfield, near Saddleworth.—WAL.: On Snowdon, near Llanberris Pass, and on the adjacent Mountains, especially near Twll Du, *Mr. W. Wilson*. Rocks of Nant Phrancon, in situations from 200 to 650 yards of elevation, *Mr. H. Watson*.—SCO.: Finlarig Burn, near Killin, Perthshire, *Mr. Wilson*. Argyleshire, *Mr. J. Hooker*.—IRE.: At Killarney (very plentiful), *Mr. Wilson*. Shanafolia Mountain, *Mr. Babington*. Kerry mountains, Cunnemara, &c., *Mr. Mackay*.

## TRICHOMANES, Linn. BRISTLE-FERN.

(Τριξ, τριχος, a hair, and μακρος, loose or long, from the long, free hairs which terminate the receptacles.)

PLATE OF GENERA, FIG. II.

*All the species of this beautiful genus, amounting to 46 in number, are very cellular and tender, their fruit attached to the midrib of a lobe, as in the last genus, but here the receptacle is one-valved, and the midrib not terminated by the thecæ and confined within the receptacle, but projecting much beyond it, and like a hair in appearance. We have but one species, and that very rare.*

## TRICHOMANES BREVISETUM.

SHORT-STILED BRISTLE-FERN. CUP GOLDDLOCKS.

(Plate 4, fig. 6.)

CHA.—Fronde thrice pinnatifid. Lobes linear, entire. Rachis winged. Receptacles urceolate.

SYN.—*Trichomanes brevisetum*, *Hort. Kew.*, *Hook. in B. Fl.*, *Smith in E. Fl.*, *Mack.*—*Trichomanes alatum*, *Hook. in Flo. Lon. N. S.*, *Swz.*, (Not of *Willd.*)—*Trichomanes Pyxidiferum*, *Huds.*, *Bolt.*, *With.*, *Hull.* *Hymenophyllum alatum*, *Smith in E. B.*, *Willd.*—*Hymenophyllum Tunbridgense* β, *Smith in Fl. Br.*

FIG.—*E. B.* 1417.—*Ray. Syn. t. 3, f. 3.*—*Bolt. 30.*—*Flo. Lon. 53.*

DES.—Root very thick, black, and densely hairy. Rachis smooth and winged all the way down. Frond pellucid, membranous, dichotomously branched in all its parts, 6 to 12 inches high, dark green. Pinnæ alternate, 12 or 14 pair, vertical, much cleft, lobes ultimately linear, but every where running much into each other, their veins conspicuous, prominent, and beautifully branched. Receptacles pitcher-shaped, taking the place of lobes, but not confined to those nearest the main stem, as in the last genus.

HAB.—Near Killarney, in several situations, *Mr. W. Wilson*. Hermitage in the county of Wicklow, *Mr. Nuttall*. Powerscourt Waterfall, *Mr. Mackay*. Once found in Ballinhasy Glen, near Cork, by *Mr. J. Drummond*.

GEO.—St. Domingo, Jamaica, the Caribees, Madeira, &c.

## OSMUNDA, Linn., ROYAL-FERN.

(Osmund, the Saxon for strength, this plant being the largest and strongest of our Ferns (?))

## PLATE OF GENERA, FIG. XIV.

*In this genus the upper part of the leafy frond becomes changed into a compound spike of fructification, without any indusium, receptacle, or annulus. Osmunda is a small genus, the species of which very much resemble each other in size and character. They are natives of Europe and North America.*

## OSMUNDA REGALIS.

ROYAL-FERN. WATER-FERN. FLOWERING-FERN.

(Plate 4, fig. 7.)

CHA.—Frond bipinnate. Pinnules oblong, nearly entire, slightly aurieled. Sori terminal.

SYN.—*Osmunda regalis*, Linn., Willd., Bolt., and all Modern Botanists.

FIG.—*E. B.* 209.—*Bolt.* 5.—*Flo. Dan.* 217.—*Flo. Lon.* 150.—*Ger.* 1131.

DES.—Root a thick, short, scaly and fibrous tuber. Rachis smooth, rigid, upright. Fronds several, 3 to 6 feet high, bright green, twice pinnate. Pinnæ distant, nearly opposite. Pinnules almost sessile, oblong, blunt, with waved or slightly erenate edges, frequently aurieled. Those pinnæ on the top of the frond are either wholly or partially changed into fructification, when they appear like a compound spike, each bunch, of which seems composed of a number of circular bundles of capsules. The thecæ are petioled and beautifully reticulated. Spores nearly globular.

VIR.—The internal parts of the root, as well as the young fronds, were once used in Pharmacy as a cure for bruises, and as conferring strength.

SIT.—In wet woods, swampy moors, &c.

HAB.—ENG.: Corner of the Lake at Uckfield, Sussex, and at Bulwell, Notts, (near the upper mill,) *Mr. T. H. Cooper*. Near Chudleigh, on the banks of the Teign, also near Ivy Bridge on the Erme, and on the Goonhilly Downs, about St. Ives, *Mr. Jones*. Chat Moss, *Mr. W. Christy*. Woolston Moss and other places near Warrington, Lancashire, *Mr. W. Wilson*. Isle of Man, *Mr. C. Forbes*. Pottery Car, near Doncaster, *Mr. S. Appleby*. Dr. Kavanah's Wood, Great Warley Common, also near the Barracks, on Little Warley Common, *Mr. R. Castles*. Near Leith Hill, Surrey, and in several places from 5 to 8 miles S. W. of Dorking, *Mr. W. Pamplin*. On Bagshot Heath, *Mr. J. Lloyd*. Ellesmere Lakes and West Felton, Salop, *Mr. W. Leighton*. Tonbridge, *Mr. Trevelyan*. Sussex and Isle of Wight, *Rev. G. E. Smith*. Norfolk, *Miss Bell*. Warwickshire, *Rev. W. Brce*. Near Leeds, *Mr. Denny*.—SCO.: Head of Loch Fine, to the N.E. of Inverary, Argyleshire, and near Loch Lomond (Dumbarton side), *Mr. H. C. Watson*. At the side of the Loch at Inchnedamff, Sutherlandshire, *Dr. Johnston*. Aberdeenshire and coast of Kincardineshire, *Dr. Murray*.—IRE.: Mucruss Abbey, *Mr. Kelly*. Castlebar, Mayo, *Dr. Osborne*. Kelly's Glen, Co. Dublin, &c., *Mr. Mackay*.

GEO.—Europe, chiefly the Northern parts, and all the United States.

## BOTRYCHIUM, Linn. MOON-WORT.

(From *βολος*, a bunch, as its fruit is borne in clusters.)

PLATE OF GENERA, FIG. XV.

The fruit in this somewhat extensive genus is produced upon a compound spike distinct from the leafy expansion, though attached to it at the stem. The thecae are opaque and sessile. There is only one British species.

## BOTRYCHIUM LUNARIA.

COMMON MOON-WORT.

(Plate 4, fig. 8.)

CHA.—Fronde pinnate, solitary. Lobes flabelliform, crenate.

SYN.—*Botrychium lunaria*, Swz., Willd., Hook., Mack., Smith in *E. Fl.*, Gray.—*Osmunda lunaria*, Linn., Smith in *Fl. Br.* and *E. B.*, Bolt., Lam., Dicks., Ehrh.—*Osmunda lunata*, Salisb.—*Lunaria minor*, Ger., Ray, Matth., Camer., Fuchs., Gesner, &c.

FIG.—*E. B.* 318.—*Bolt.* 4.—*Flo. Dan.* 18, f. 1.—*Flo. Lon.* 66.

DES.—Root of thick, smooth, yellow fibres. Frond of a dull, yellowish green, 2 to 6 inches high, rarely more than one from a root, quite smooth in every part. Stem hollow, rather succulent, half way up it divides into two branches, one being a pinnatifid or pinnate frond, the other the fruit. Pinnules of the leafy part five or six pair, opposite, to each, decurrent, fan-shaped, regularly crenate. Fruit covering the upper part of the other branch of the stem in a compound spike, not in aggregate clusters, as in *Osmunda*, but separate, though nearly touching each other, and arranged in single lines along the branches of the spike. The thecae are opaque, sessile, round, smooth, yellow at first, afterwards brown. Spores oval, smooth, generally attached to each other in pairs.

VIR.—Its virtues are more imaginary than real, more magical than physical. Its name *Lunaria*, or Moon-wort, is taken from the shape of the leaves, and if gathered by the light of the moon, was said to “doo wonders.” Gerard mentions a remarkable instance of the properties attributed to it by the alchemists and witches, “that it will loose locks and make them fall from the feet of horses that do graze where it doth grow;” “too drowsie a dream” for even the credulous Gerard to believe, but he adds, that it is “singular for wounds.”

SIT.—In pastures chiefly in the northern and mountainous countries.

HAB.—ENG.: Clifton, Norton, Fiskerton, Newstead, and Sherwood Forest, Notts, Mr. T. H. Cooper. Warwickshire, Rev. W. Bree. Pottery Car, Mr. S. Appleby. Shotover Hill, Oxon, Mr. Baxter. Deep Dean, near Dorking, Mr. J. Beevis. Shirley Common, near Croydon, Surrey; between Dartford and Foot's Cray, Kent; and S. W. of Petersfield, Hants, Mr. W. Pamplin. Leith Hill, Surrey. Newcastle Town Moor, Mr. R. Bowman. Southport, Lancashire, Mr. Rylands. Cheshire and Derbyshire, Mr. W. Wilson. Greenfield, near Manchester, Mr. J. Merrick. Near Barnstaple, Devon (1836),



*Mr. J. Nash*. Near Titchborne, Hants (1836), *Mr. Forder*. South Kent, *Rev. G. E. Smith*. Common about Settle, Yorkshire, *Mr. J. Tatham*. Linton, Cambridgeshire, *Mr. C. Babington*. Sea banks near Tynemouth, Northumberland, *Miss Hancock*.—SCO.: Bernerside Hill, W. of Berwickshire, *Mr. W. Baird*. South side of Loch Tay, and ascending to 3000 feet on adjacent mountains; Clova and Pentland Hills; Breadalbane Mountains, &c. *Mr. H. Watson*. Blair Athol, Perthshire, *Mr. W. Brand*. Higher Tees, *Mr. J. Hogg*. Moray, *Rev. G. Gordon*. Orkney, *Rev. C. Clouston*. Aberdeenshire, *Dr. Murray*.—WAL.: Near Wrexham, *Mr. J. E. Bowman*. Near Rodney's Pillar, Montgomeryshire, *Rev. A. Bloxam*. Craig Breidden, *Mr. Dovaston*.

GEO.—Throughout North Europe and North Asia.

## OPHIOGLOSSUM, Linn. ADDER'S-TONGUE.

(From  $\sigma\phi\iota\varsigma$ , a serpent, and  $\gamma\lambda\omicron\sigma\sigma\alpha$ , a tongue.)

PLATE OF GENERA, FIG. XVI.

*This genus bears its fruit in a simple spike attached to a leafy frond. The thecæ are connected not only to each other, but attached by their whole base to the stem which bears them; when ripe they open transversely. There are 12 foreign species of this genus, inhabitants of Europe and North America.*

## OPHIOGLOSSUM VULGATUM.

COMMON ADDER'S-TONGUE.

(Plate 4, fig. 9.)

CHA.—Frond entire, solitary, ovate, obtuse.

SYN.—*Ophioglossum vulgatum* of most Botanists.—*Ophiog. ovatum*, *Salisb.*

FIG.—*E. B.* 108.—*Bolt.* 3.—*Flo. Lon.* 78.—*Flo. Dan.* 147.—*Ger.* 404.—*Schk.* 153.

DES.—Root composed of a few stout, yellow, smooth fibres, running horizontally. Frond of one entire, upright leaf, ovate, blunt, 2 to 6 inches high, of a lurid green colour. Stem tapering downwards, and hollow. Fruit in a simple, unbranched, stalked, and pointed spike, connected with the leafy expansion. Thecæ yellow, opaque, sessile, in two single rows, connected with each other, so that after the round, smooth, yellow seeds are dispersed, a number of transverse clefts are seen along each side of the spike. Sometimes found with more than one spike, at other times the leaf-like frond is deeply cleft at the top.

VIR.—It is considered by the country people as valuable to form an ointment for wounds, and for this purpose is gathered by baskets-full; for be it observed that in some parts of the country it is almost as abundant as the herbage among which it grows.

SIT.—In meadows and moist pastures in most parts of the kingdom.

HAB.—West Felton, Salop, *Mr. W. Leighton*. Pottery Car, *Mr. S. Appleby*. Various parts of Surrey, Kent, Herts. and Hants, *Mr. W. Pamplin*. Near Barnstaple, Devon, *Mr. J. Nash*. Near Bristol, *Miss Worstley*. Field



at the side of the pond, in Wike Farm, Sion Lane, Isleworth; near the ladder stile, Osterley Park, near Brentford, Middlesex; and 4 miles south of Dorking (abundant), *Mr. J. Beevis*. Meadows of Long Leet, Wiltshire, *Mr. Rowden*. Near Warrington, Lancashire, and Denbighshire, *Mr. W. Wilson*. Sussex and South Kent, *Rev. G. Smith*. Norfolk, *Miss Bell*. Near Braunston, Leicestershire, *Rev. A. Bloxam*. Somerset, *Mr. A. Southby*. Warwickshire, *Rev. W. Bree*. Round Howe, near Richmond, Yorkshire, *Mr. J. Ward*. Heanor, Derbyshire, and Colwick, Notts, *Dr. Howitt*. Middleton-one-row, Durham, *Mr. R. Bowman*. Field behind Heawood Hall, Alderley, Cheshire, *Mr. H. Watson*.—WAL.: Near Wrexham, *Mr. J. E. Bowman*.—SCO.: Dalmeny Woods, near Edinburgh, *Mr. W. Brand*. Orkney, *Rev. C. Clouston*. Balmuto, *Miss Boswell*. Carlowie, *Mr. Falconer*.—IRE.: Lawn of the Observatory, Dunsink, *Mr. Kelly*. Not unfrequent in Ireland, *Mr. Mackay*.

GEO.—Throughout Europe, and from New York to Pennsylvania in North America.

## PILULARIA.—PILL-WORT.

(From *Pilula*, a little Pill, from the shape of its seed-vessels.)

PLATE OF GENERA, FIG. XVII.

## PILULARIA GLOBULIFERA.

CREEPING PILLWORT. PEPPER-GRASS.

(Plate 4, fig. 10.)

CHA.—Leaves filiform. Stem creeping. Receptacles coriaceous, hairy, nearly radical.

SYN.—*Pilularia globulifera* of all Botanists.

FIG.—*E. B.* 521.—*Bolt.* 40. *Flo. Dan.* 223.—*Hook.* in *Flo. Lon.* 83.

DES.—Stem very long, cylindrical, and creeping close to the ground, throwing off at intervals of half an inch or more several simple, very small, smooth, radical fibres, and from the same part upwards 2 to 6 filiform, hollow, green leaves, about 2 inches long, among which, at their base, grow one or two receptacles, not radical, as generally said, but attached to the *upper* part of the stem, and therefore, although near the roots, not attached to them. The receptacles are round, like a pepper-corn (hence the name of the plant), brown and hairy. The spores are, according to Sir J. E. Smith, oblong, contracted in the middle, and slightly pointed at one end.

SIT.—Pools of water, edges of lakes, &c. not uncommon.

HAB.—Bomere Pool, Salop, *Rev. E. Williams*. Coleshill Pool, Warwickshire, *Rev. W. Bree*. Beam Heath, near Nantwich, Cheshire, *Mr. J. E. Bowman*. Prestwich Car, Northumberland, *Mr. R. Bowman*. In a small pool between Okeshot Hill and Claremont Park, Surrey, *Mr. H. Watson*. Near Richmond, Yorkshire, *Mr. J. Ward*. Sussex (*Mr. Borrer*), *Rev. G. E. Smith*. Grosvenor and Roche, Cornwall, *Jones's Bot. Rambles*. Filby and Hopton Commons, near Yarmouth, *Mr. Paget*. Once and perhaps still in the ponds at Roehampton, Surrey, and on Iver Heath, Middlesex, *G. F.* Once

plentiful at Bartington Heath, Cheshire, and still found at Baguley Moor, in the same county, *Mr. W. Wilson.*—*WAL.*: Near Llanfaeloy, Anglesea, and border of Llyn Idwel, Caernarvonshire, *Mr. W. Wilson.* *SCO.*: Near Inverskin, Sutherland, *Mr. Campbell.* Marshy ground between the village of Currie and the Pentland Hills, Edinburgh, *Mr. H. Watson.* Near Slateford, Forfarshire, *Mr. W. Brand.*

GEO.—Most parts of Europe.

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## ISOETES, Linn. QUILLWORT.

(From *ισος*, equal, and *ετος*, the year, the plant being evergreen.)

PLATE OF GENERA, FIG. XVIII.

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## ISOETES LACUSTRIS.

EUROPEAN QUILLWORT. MERLIN'S GRASS.

(Plate 4, fig. 11.)

CHA.—Leaves subulate, bluntly quadrangular, formed of four transversely-jointed longitudinal cells.

SYN.—*Isoetes lacustris* of all Modern Botanists.

FIG.—*E. B.* 1084.—*Flo. Lon. N. S.* 131.—*Bolt.* 41.—*Flo. Dan.* 191.—*Schk. fil.* 173.

DES.—Root tufted, composed of long, branched, smooth fibres. Leaves radical, tufted, filiform or subulate, 2 to 4 inches high, light green, and very brittle. Receptacles formed of the base of the leaves: the outer, which are also the larger and older leaves, bearing perfect seeds; the inner and younger leaves produce finer granules, said by some to be pollen, by other Botanists with more probability considered immature seeds, or rather spores. (See Introduction, page 9.)

*Mr. W. Wilson* finds two varieties in Wales; the one densely tufted, with slender, erect leaves, the other with broader and widely-spreading leaves. The former of these *Dr. Hooker* thinks may be the *Isoetes setacea* of *Bose*. *Sprengel* says the plant grows at the bottom of carp ponds, where it would not be of very easy access, did not the fish assist the Botanist by disengaging it from the mud, when it is found floating at the edges of the pond.

SIT.—Found only in the extreme north of Wales, north of England, and in Scotland, which is a curious circumstance, because submersed water plants are not in general so strictly confined to particular latitudes or altitudes.

HAB.—*Prestwick Carr*, Northumberland, *B. G.* *Uleswater*, Cumberland, *Mr. Williams.* In *Llyn-y-cwm*, *Pfynnon Ffich* (*Snowdon*), *Lake Ogwan*, and *Llanberris lakes*; also in *Floutern Tarn*, between *Scale Face* and *Whitehaven*, *Mr. W. Wilson.* Lakes of *Denbighshire*, *Mr. J. E. Bowman.*—*SCO.*: *Loch Callader*, *Aberdeenshire*, and *Loch Brandy*, *Forfarshire*, *Mr. W. Brand.* *Loch Whirral*, *Forfarshire*, *Dr. Graham.* *Loch Tay*, *Perthshire*, *Dr. Greville.* Most of the *Scottish Lakes*, *Mr. H. C. Watson.*—*IRE.*: Lakes in the *Rosses*, *Donegal*, *Rev. Mr. Murphy.*

GEO.—More copious in Sweden and Denmark than elsewhere. New York and northwards in America.







## LYCOPODIUM, Linn. CLUB-MOSS.

(From *λύκος*, a wolf, and *πούς, πούς*, a foot; the ends of the stems appearing like the hairy feet of some animals.)

## PLATE OF GENERA, FIG. XIX.

A very extensive genus of no less than 140 species, found in all parts of the world, particularly in the colder climates. Six only are natives of Britain. Always taken for and called Mosses by the old Botanists; and they do indeed resemble that tribe in many of their external characters, having sessile, smooth, entire, or at most serrated leaves. Their fruit, however, is greatly different; most species of the *Lycopodiums* bear it in terminal scaly spikes, in a few others, among which is our *Lycopodium selago*, the fruit is not confined to the apex of the branches, but is found in the axils of the leaves throughout the whole plant. The root grows from every part of the stem which touches the ground.

## LYCOPODIUM CLAVATUM.

COMMON CLUB-MOSS. FOX-TAIL. STAG'S-HORN. WOLF'S-CLAW.

(Plate 6, fig. 1.)

CHA.—Stem trailing. Leaves linear, incurved, hair-pointed. Thecæ in naked, stalked, double spikes. Scales ovate, serrate.

SYN.—*Lycopodium clavatum* of most Botanists.—*Muscus clavatus* seu *Lycopodium*, *Ger. Park.*, &c.—*Lycopodium officinale*, *Neck.*—*Lepidotis clavata*, *Beauv.*

FIG.—*E. B.* 224.—*Ger.* 1562.

DES.—Root fibrous, scattered. Stem branched, several feet long, lying on the ground, bright green. Leaves crowded, linear, curved, with a long, diaphanous, hair-like point. Spike of fruit cylindrical, usually in pairs, yellow, about an inch long, supported upon a rigid, upright, long stem, which is void of leaves, but set at intervals, with whorls of very fine, short setæ. Scales of the spikes broadly ovate, pointed, and dentate or serrate. Thecæ large, round, one to three, attached to the base of each scale, and filled with a very fine yellow powder.

VIR.—For the virtues of this plant see page 12, in addition to which it is said to be used to ameliorate wines; but its emetic properties render this doubtful.

SIT. & HAB.—On hill-sides, particularly in the northern part of the kingdom, but not ascending to so lofty a situation as some other species. Hoy Hill, Orkney, *Rev. C. Clouston*. Plentiful in the Highlands, in Cumberland, and in North Wales, *Mr. H. Watson*. Derbyshire, *Dr. Howitt*. Settle, Yorksh., *Mr. J. Tatham*. Notts, *Mr. T. H. Cooper*. Coleshill, Warwickshire, *Rev. W. Bree*. Norfolk, *Miss Bell*. Sussex, *Rev. G. E. Smith*. Somerset, *Mr. A. Southby*. Dartmoor, &c., *Mr. Jones*. Oxfordshire, *Mr. Baxter*. Lane between Dorking and Leith Hill, and on Addington Hills, beyond Croydon, Surrey; also on the high heathy ground above Tring, Herts, *Mr. W. Pamplin*. Near Todmorden, Lancashire, *Mr. W. Wilson*.—IRE.: Kelly's Glen, Ballynascoorney, and other places on the Dublin Mountains, *Mr. Mackay*.

GEO.—In most of the northern parts of Europe and Asia, and from Canada to Pennsylvania in America.

## 2.—LYCOPODIUM ANNOTINUM.

## INTERRUPTED CLUB MOSS.

(Plate 5, fig. 2.)

CHA.—Stem procumbent. Leaves in five rows, lanceolate, acute, spreading. Spikes simple, scales broadly ovate, imbricated.

SYN.—*Lycopodium Annotinum*, Linn., Willd., Spreng., Smith, Hooker, Ehrh., Huds., Lightf., With., Pursh, Gray.—*Lepidotis Annotina*, Beauv.

FIG.—*E. B.* 1727.—*Fl. Dan.* 127.—*Dill Musc* 63, f. 9.—*Schk. fl.* 162.

DES.—Root stoutly fibrous, scattered. Stem very long and trailing, dichotomously branched, of a dullish green color, and extending in length from year to year. Branches simple or nearly so when fruitful, upright at first, afterwards becoming decumbent. Leaves in 5 rows, lanceolate, acute, spreading, entire or very slightly serrated. Fertile spike solitary, sessile, terminal, an inch long, scales very short, very broad, pointed, and imbricated.

Sir J. E. Smith says that the scales of the spike of one season falling off, the stem thus left naked gives rise the following season to leaves, but these not being so numerous as in the other parts of the plant, the stem acquires an interrupted habit.\*

SIT.—On the highest Welch and Scottish Mountains.

HAB.—Pretty frequent between 500 and 850 yards on the mountains of Clova, and the W. of Aberdeenshire; I have never seen it above 900 or below 400 yards; Glen Dole, Forfar, and mountains adjacent; Ben-na-Baird, Loch-na-garr, &c. Aberdeen, *Mr. H. Watson*. Freewater, Rosshire, *Mr. Staples*. Hoy Hill, Orkney, *Rev. C. Clouston*. Summit of Cairngorum, *Sir W. J. Hooker*. Still found on Glyder Vawr, Snowdon, but reduced to a solitary root and when last seen (1836) without fructification, *Mr. W. Wilson*. Not in *Mr. Mackay's* "*Flora Hibernica*."

GEO.—Europe in mountainous countries, from Canada to Pennsylvania, and in N. Asia.

## 3.—LYCOPODIUM INUNDATUM.

## MARSH CLUB MOSS.

(Plate 5, fig. 3.)

CHA.—Stem creeping. Branches simple, erect. Leaves and scales linear, acute, curved upwards. Spikes solitary.

SYN.—*Lycopodium inundatum* of most Botanists.—*Plananthus inundatus*, Beauv.

FIG.—*E. B.* 239.—*Flo. Dan.* 336.—*Dillen Musc* 62 f. 7 (good).

DES.—Stem very closely appressed to the ground, one to two

\* I cannot reconcile this to the appearance of my specimens, but rather suppose that as in the former species the spiko wholly falls off, and the next year's shoot puts forth more vigorous leaves than those which terminated the old stem, thus giving the jointed appearance which the plant presents, but I have never seen it in a fresh state, and therefore write this with hesitation.

inches long, and but slightly branched, bearing fibrous roots all along its lower surface. Branches simple, barren ones decumbent, fertile ones upright. Leaves irregularly placed, crowded, linear lanceolate, acute, all turned upwards. Spikes solitary, terminal, green, one inch long, quite erect. Scales linear, dilated at the base, curved upwards, entire or with one or two teeth only in luxuriant specimens.

This plant, which, like the rest of its tribe, is perennial, shows very strikingly the manner of growth of all the creeping species, though there are few of them so rapid in their decay as this. It creeps along the ground, and grows at one end as it decays at the other; thus if its habitat be a level piece of mud, as it generally is on commons, &c., the effect is easily seen in a black mark or line of the decayed plant, sometimes for many inches beyond where it is then vegetating. It ceases to grow in the winter, but continues to decay; thus very many plants are exterminated, and only the vigorous ones have strength to put forth new foliage, of these a very small portion generally remains, and thus it is that the plants are always small in the early part of the season.

SIT.—On wet moors and commons particularly where turf has been pared. Not in Ireland.

HAB.—Valley near Cæsar's Camp, Wimbledon Common, Surrey; bogs near Titchborne Church, Hants (1836); Putney Heath; Bagshot Heath; Shirley Common, Surrey, and Keston Heath, Kent, *Mr. W. Pamplin*. Esher Common and Cobham Common, Surrey, *Mr. R. Castles*. Delamere Forest, Bartington Heath, and Baguley Moor, Cheshire, *Mr. W. Wilson*. Filby, Belton, Yarmouth, Norfolk, *Mr. Paget*. Near Loch Lee, Nairnshire, *Mr. W. Stables*.—Near Craig Darrock, Rosshire, *Rev. G. Gordon*. Sussex and South Kent, *Rev. G. E. Smith*. Coleshill, Warwickshire, *Rev. W. Bree*. Bovey Heathfield, Devon, *Mr. Babington*.

GEO.—Europe, Isles of Bourbon. (?) Canada to New York.

#### 4.—LYCOPODIUM SELAGINOIDES.

PRICKLY CLUB-MOSS. MOUNTAIN-MOSS.

(Plate 5, fig. 4.)

CHA.—Stems procumbent. Leaves lanceolate, acute. Spikes large, solitary. Scales ovate, deeply toothed.

SYN.—*Selaginella Spinosa*, *Beauv.*—*Lycopodium selaginoides* of *Modern Authors*.—*Bernhardia spinosa*, *Gray*.

FIG.—*E. B.* 1148.—*Flo. Dan.* 70.—*Dill. Mus.* 68, f. 1.—*Schk. fl.* 165.

DES.—Stems creeping, slightly branched, 2 or 3 inches long. Barren branches delicate, recumbent, simple. Fertile branches upright, rigid, bearing a solitary spike. Leaves lanceolate, acute, toothed, imbricated, bright green. Spike large, oblong, cylindrical, yellowish, and terminal. Scales much larger and wider than the leaves, and deeply toothed, spreading widely on account of the very large capsules.

This plant shows very well the two sorts of capsules; those in the lower part



being what in the Introduction are called spores, while the upper capsules contain only a fine powdery mass, considered pollen by some Authors, and abortive seeds by others.

SIT.—On mountain sides, and moist alpine situations.

HAB.—Abundant in the Highlands, rising to situations of 1000 yards or more in height, on the Breadalbane mountains, Perthshire. Pretty frequent on the hills of Cumberland, as around Borrowdale, Keswick, Derwentwater, &c., *Mr. H. C. Watson*. Near Richmond, Yorkshire, *Mr. J. Ward*. Dartmoor, Devon, *Rev. J. Jones*. In wet places among sand-hills on the coast of Anglesea, near Aberffraw, and on the coast of Lancashire, near Southport, *Mr. W. Wilson*. Ben Lawers, *Mr. H. C. Cooper*. North coast of Sutherland, at the sea level, *Dr. Johnston*. Rare in Aberdeenshire, *Dr. Murray*. Caernarvonshire, *Mr. J. E. Bowman*. Higher parts of the Tees, *Mr. J. Hogg*. Moray and Rosshire, *Rev. G. Gordon*. Hoy Hill, Orkney, *Rev. C. Clouston*. Clogwyn-ddur, Arddu, Snowdon, *Mr. C. Babington*. Capel Curig, *Dr. Howitt*. Llanberris Pass and Nant Phrancon, *Mr. Watson*. Ben Lomond, *Mr. W. Leighton*. Sutherland, *Dr. Johnston*. Various parts of Ireland, *Mr. Mackay*.

GEO.—Sprengel says, only found in Europe at Bremen, Oldenburgh, Silesia, Bavaria, and Switzerland. In Canada and New Hampshire, in America, according to Pursh, who says the American is smaller than the English plant.

## 5.—LYCOPODIUM ALPINUM.

SAVINE-LEAVED CLUB-MOSS.

(Plate 5, fig. 5.)

CHA.—Stem procumbent, branches fascicled, flat at top. Leaves and scales in four rows.

SYN.—*Lycopodium Alpinum* of almost all Botanists.—*Lycopodium sabinæ-folium*, *Pursh*.—*Lepidotis alpina*, *Beauv*.

FIG.—*E. B.* 234.—*Flo. Dan.* 79.—*Dill. Mus.* 58, f. 2.

DES.—Roots scattered, long, with stout, branched, downy fibres. Stem 2 to 4 feet in length, creeping quite close to the ground, very rigid, irregularly leafy. Branches alternate, along the stem at uncertain intervals, in an upright, rigid, close or fan-shaped fascicle, level at the top. Leaves blunt, oblong, imbricated in 4 rows, rather convex. Spikes terminating all the older branches, erect, an inch or less in length, and compact. Scales pointed, broad at the base, tapering upwards, with waved edges, sometimes with two or three teeth, flatter and less rigid than the leaves.

VIR.—According to Sir W. J. Hooker, it is used to dye woollen cloths of a yellow color.

SIT.—On the grassy sides of mountains.

HAB.—At 1000 yards of elevation on Carnedd David, Caernarvonshire, probably 1200 yards in Aberdeenshire, also to the summit of Ben Hope, in Sutherland, at 1000 yards or thereabouts, where the climate is probably less genial than that at 1200 yards in Aberdeenshire; to 1150 yards on Ben Nevis. Too plentiful on all the mountain tracts of Scotland to call for particular localities. On most of the Cumberland and Yorkshire mountains, *Mr. Watson*. Somerset, *Mr. A. Southby*. Near Todmorton, Lancashire, at a very low ele-



vation (a single root only), *Mr. W. Wilson*. Down to the coast in Aberdeenshire, *Dr. Murray*.—IRE.: Aghla and Barnesmore mountains, Donegal, *Mr. E. Murphy*. Barnesmoor Mountain, and Mourne Mountain, *Mr. Mackay*. Brandon Mountain, *Mr. W. Wilson*.

GEO.—All the Northern and mountainous part of Europe, as Lapland, Germany, Switzerland, Pyrenees, the Tyrol, Sweden, Norway, Russia, &c. Also in Canada and Siberia.

## 6.—LYCOPODIUM SELAGO.

FIN CLUB-MOSS. UPRIGHT FIR-MOSS.

(Plate 5, fig. 6.)

CHA.—Stem erect, dichotomously branched, flat at top. Leaves in 8 rows. Thecae axillary.

SYN.—Plananthus selago, *Beauv.*—Selago vulgaris, *Dillw.*—Lycopodium abietiforme, *Gray.*—Lycopodium selago of other Botanists.

FIG.—*E. B.* 233.—*Flo. Dan.* 104.—*Dill. Mus. t.* 56, *f.* 1.

DES.—Root tufted, fibrous. Stems two to six inches high, growing quite erect, one issuing only from the root, and becoming divided dichotomously until they form a cluster of from 6 to 10 ultimate divisions; the upper fruitful branches are, however, scarcely more than forked. Leaves in 8 rows of a dark shining green color, crowded, lanceolate, entire, acute, convex on the outer side, a little spreading, and curved upwards. The fruit is not borne in a terminal spike, as in the other species, but in the axils of the common leaves, all down the upper part of the stem. Capsules large, kidney-shaped, regularly two-valved, opening by a transverse fissure, and scattering minute, yellow, globular, smooth seeds.

This plant is likewise viviparous, producing not only capsules of seeds, but occasionally also curious petioled buds, which consist of three or four differently-sized ovate leaves; they are irregularly placed in the axils of the common leaves, that is, in the place of the capsules.

SIT.—On mountain sides, &c.

HAB.—It attains the summit of Ben-na-Muich-dhu, the loftiest of the northern Grampians or Cairngorum range, and the second summit of Britain (4320 feet). Common everywhere on the hilly tracts of Britain, especially the Scottish Highlands.—ENG.: Helvellyn, Skiddaw, &c.; at Widdy Bank, Teesdale; on the loftiest rocks of Dartmoor, and above Edale Chapel, Derbyshire, *Mr. H. C. Watson*. Common about Settle, *Mr. J. Tatham*. Waldron Down, Sussex. Near Bristol, *Miss Worsley*. Shotover Hill, Oxon, *Mr. Baxter*. Mansfield Forest, near the Blidworth Gate, *Mr. T. H. Cooper*. Coleshill, Warwickshire (rare), *Rev. W. Bree*. Wensley dale, Yorkshire, *Mr. J. Ward*. Once seen on Woolston Moss, near Warrington, *Mr. Wilson*.—WAL.: Frequent on the Welch mountains, where a variety is found with the leaves widely spreading, *Mr. W. Wilson*.—IRE.: Lough Bray and mountains, in south of Ireland (frequent), *Irish Flora*. Known in Kerry as Virgin Mary's Furze.

GEO.—Over Europe and North-America. (Not in Pursh.)

## EQUISETUM, Linn. HORSE-TAIL.

PLATE OF GENERA, FIG. XX.

*A widely-distributed but not very extensive genus, which inhabits for the most part temperate and cold countries. The species now living are all small plants, but the fossil remains of the Equisetaceæ show that at some former period gigantic specimens must have been frequent. Our plants prefer watery situations and strong soil. They may be divided into sections as follows:—*

- \* Fertile stems naked, succeeded by branched barren ones.
- \*\* Fertile stems branched from their first growth.
- \*\*\* Fertile stems not branched at first, but finally becoming so.
- \*\*\*\* Fertile stems always remaining simple, barren stems the same.

*Equis. fluviatile, drummondii, and arvense, belong to the first section; E. sylvaticum to the second; E. palustre to the third; E. variegatum and hyemale to the fourth.*

## 1.—EQUISETUM FLUVIATILE.

GREAT HORSE-TAIL. WATER HORSE-TAIL.

(Plate 5, fig. 7.)

CHA.—Barren stems erect, with 30 to 40 branches in each whorl. Fertile stems with 7 or 8 toothed loose sheaths.

SYN.—*Equisetum fluviatile*, Linn., Willd., Smith, Hook., Bolt., Huds., Lightf., With., Gray.—*Equisetum telmateia*, Ehrh., Flo. Dan.—*Equis. eburneum*, Roth, Schr.—*Equis. majus*, Ray, Ger.—*E. maximum*, Lam.

FIG.—*E. B.* 2022.—Bolt. 36, 37.—Ger. Her. 1113.—Flo. Dan. 1469.

DES.—Barren stem 2 to 4 feet high, quite erect, white, succulent, surrounded by whorls of from 30 to 40 branches. Branches rapidly growing upon the stem as soon as it issues from the ground, giving it soon a broad-topped appearance. In its future growth this blunt character is lost, the main stem becoming elongated, and the branches are then long, slender, simple, jointed, ascending, with 4 or 5 large channels along their surface, and at the angles of these 4 or 5 other very minute ones. Fertile stems 4 to 6 inches high, arising in March or April, and decaying as the barren stems arise, reddish white, extremely succulent, and wholly without branches at any time. Their sheaths 4 to 6 in number, nearly an inch long, and generally so close together as to overlap each other, very deeply, sharply, and numerous toothed. Catkin large, conical, blackish.

Withering says, fertile stems sometimes leafy. He ought rather to have said, barren stems sometimes fruitful, as a catkin is often found in the middle or latter part of summer, terminating it, particularly if the weather has been dry for some time previously; in fact it may be produced at any time with such cultivated plants as grow in pots, merely by removing the pots from the watery situation in which they are usually placed, into a drier spot of ground. Mr. W. Wilson attributes this state of the plant to drought as here stated, and adds that he has seen a specimen gathered near Bangor where this catkin was topped by a prolongation of the branched frond, (July 1836.)

The name Fluvatile is not so applicable to this species as it would have been to some others; it is rarely found on the banks of rivers or ponds, nor do I remember ever having seen it growing in the water. It rather affects strong loamy damp ground, clayey banks, and swampy bogs.

HAB.—Very abundant in some parts of England, as about London, in Hants, Bucks, &c.; but Mr. Watson thinks scarcely a common plant generally.

GEO.—Europe, Siberia, North America.

## 2.—EQUISETUM DRUMMONDII.

BLUNT-TOPPED HORSE-TAIL.

(Plate 5, fig. 8.)

CHA.—Barren stem blunt, erect, with about 12 branches. Fertile stems with 5 or 6 prickly-toothed sheaths.

SYN.—*Equisetum Drummondii*, Hook. in *E. B. suppl. Mack., Fl. Hib.*

FIG.—*E. B. suppl. t. 2777.*

DES.—Barren stem exceedingly delicate, finely tapering upwards, very rough on the angles, with white and shining particles of silice, 12 inches high, of a pale, lightish green, particularly the scales, which widen upwards, 6 or 8 in number, rather close together, with long, black, terminal teeth.

This plant differs from *Equisetum arvense* in its more glaucous green color, very much more delicate habit both of stem and branches, and blunter outline. The fertile frond is much more rigid in texture, with harder, whiter, and more numerous-toothed sheaths, and the points of the teeth are more diaphanous than in the next species.

HAB.—First found by Mr. T. Drummond at Wolf Hill, the seat of W. Thompson, Esq., near Belfast.

## 3.—EQUISETUM ARVENSE.

CORN HORSE-TAIL.

(Plate 5, fig. 9.)

CHA.—Barren stem taper-pointed, decumbent. Sheaths of the fertile stem 3 or 4, distant, loose.

SYN.—*Equisetum arvense*, Linn., Willd., Smith, Hook., Bolt., Ehrh., Huds., Lightf., With., Pursh, Mack., Gray.—*Equisetum segetale*, Ger.

FIG.—*E. B.* 2020.—*Bolt.* 34.—*Flo. Lon.* 64.—*Ger. Her.* 1114.—*Park.* 1202.

DES.—Root branched, creeping. Main stem of the barren frond procumbent, tapering to the end, sometimes very long, pointed, rough, with whorls of branches all the way down, and forked at the base; that is to say, two or more fronds springing from the same part of the root. Branches simple, varying much in number, 14 or



16 if all are present, but generally not more than 8 or 10, or even 6, at the upper part of the frond; they are dark green, rough, 4 channelled, with simple angles. Fertile fronds appearing before the others, light brown, with 4 or 5 distant, deeply toothed sheaths. The teeth are sharp, ribbed, and rather dark colored, particularly round their edges. As the fertile frond comes to maturity, the sheaths decay from the point downwards; thus their black tooth is often tipped with white, and surrounded with a diaphanous membrane, particularly the upper sheaths, which are larger and longer than those below.

The plant puts on very different characters in different circumstances; sometimes it appears as a cylindrical pointed stem, without any branches, this is its early state, for it does not throw out branches immediately, as in *Equisetum Fluvatile*, therefore it never appears with a densely leafy, obtuse frond as that does. On strong soil, and in shady situations, as when hid among growing corn, the branches become exceedingly long, scattered in habit, and often geniculated, in which state it is represented by Gerard as *Equisetum segetale*. The closeness and number of the sheaths of the fertile stem is by no means a sure diagnostic of any of our species; the remarks respecting them, therefore, are more general than specific information.

SIT.—In cornfields, sandy banks, waste ground, &c.

HAB.—This species is so common, and so difficult to eradicate, as to be a very troublesome weed.

GEO.—Found equally in Europe, Asia, and North America.

#### 4.—EQUISETUM SYLVATICUM.

WOOD HORSE-TAIL.

(Plate 5, fig. 10.)

CHA.—Stem erect. Branches compound, deflexed. Sheaths loose.

SYN.—*Equisetum Sylvaticum* of all Modern Botanists.

FIG.—*E. B.* 1874.—*Bolt.* 32, 33.—*Flo. Dan.* 1182.—*Schk. fl.* 166.

DES.—Stem erect, from 6 inches to 2 feet high, branched, bright green. Branches compound, slender, smooth, drooping at the ends, and whorled, the lower part of the stem without branches. Catkins ovate, erect, stalked, and terminating the stem, borne early in the season, and dying away long before the remaining part, as is the case with all the following species; it is very rarely, however, found in fruit. Sheaths deeper coloured than the stem.

SIT.—In woods and shady places, chiefly in the North.

HAB.—Benthal Edge, Salop. *Mr. W. Leighton.* Hampstead Heath, and fields towards Hendon, Middlesex. *Mr. W. Pamplin.* Wheeler's Wood, Hampstead Heath. *Francis.* (This is not an original habitat of this and some



other plants found there ; for even the wood took its name from Mr. Wheeler's sowing in it the seeds of all uncommon plants found by him at other places, and a root of this was planted there.) In Bagley Wood, between Oxford and Abingdon, *Mr. W. Baxter*. Forge Valley, near Scarborough, Yorkshire ; near the ruins of Dale Abbey, and Southwood, near Calke Abbey, Derbyshire, *Rev. A. Bloxam*. Cromford Moor, Derbyshire, *Dr. Howitt*. Near Richmond, Yorkshire, *Mr. Ward*. About Settle, Yorkshire (scarce), *Mr. J. Tatham*. Near Leeds, *Mr. Denny*. Sussex, *Rev. G. E. Smith*. Somerset, *Mr. Southby*. Cumberland, Cheshire, Lancashire, *Mr. Watson*. Orkney, *Rev. C. Clouston*. Rosshire and Moray, *Rev. G. Gordon*. Egerton, near Bolton, *Mr. W. Christy*. Frequent in Cheshire and the Highlands of Scotland, *Mr. W. Wilson*. Moist woods, Kelly's Glen, Ballynascorney, *Mr. O. Kelly*. Abundant in the North of Ireland, *Mr. Mackay*.

GEO.—All Germany, Prussia, Holland, and Switzerland. From New York to Virginia, &c., and in North Asia.

## 5.—EQUISETUM LIMOSUM.

SMOOTH NAKED HORSE-TAIL.

(Plate 5, fig. 11.)

CHA.—Stem erect, naked or branched, smooth. Sheaths short, appressed. Teeth numerous.

SYN.—*Equisetum limosum*, *Linn.*, *Willd.*, *Smith*, *Hook.*, *Bolt.*, *Huds.*, *Lightf.*, *With.*, *Mack.*, *Gray.*—*Equisetum polymorphum*, *Schr.*—*Equisetum heleocharis*, *Ehrh.*

FIG.—*E. B. 929.*—*Flo. Dan. 1184.*—*Bolt. 38.*

DES.—Root much ereeping, with scattered fibres. Stem erect, quite smooth, striated but not channelled, generally naked, but sometimes putting out a few branches late in the season, which are smooth, simple, and ascending. Catkin terminal, broad and short, for the most part sessile in the upper sheath. Sheaths short, close pressed to the stem, with very numerous short brown teeth.

Often confounded with *Equisetum Palustre*, of which by some of the older Botanists it was considered only a variety. It is, however, very distinct, and may easily be distinguished by not bearing branches till late in the season, after the catkin has decayed ; its branches also are less numerous, shorter, and either scattered over the plant or in irregular whorls ; it has shorter and more numerous toothed sheaths, which are pressed close to the stem. The whole plant is smoother, and has shorter, thicker, and nearly sessile catkins.

SIT.—In low swampy ground, sides of streams, &c.

HAB.—Not so common as *Equisetum palustre*, but pretty generally distributed. Sussex and South Kent, *Rev. G. E. Smith*. Norfolk, *Miss Bell*. Leicestershire, *Rev. A. Bloxam*. Somerset, *Mr. Southby*. Warwickshire, *Rev. W. Bree*. Wensley Dale, Yorkshire, *Mr. J. Ward*. Cheshire, Lancashire, and Cumberland, *Mr. H. C. Watson*. Derbyshire, *Dr. Howitt*. Needwood Forest, Staffordshire, and Gamlingay Bogs, Cambridgeshire. Tees, *Mr. J. Hogg*. Moray and Rosshire, *Rev. G. Gordon*. Near Wrexham, *Mr. J. E. Bowman*. Near Bristol, *Miss Worsley*. River Severn, near Shrewsbury, Hancott Pool. do., *Mr. W. Leighton*. Frequent in Ireland, *Mr. Mackay*.

GEO.—Holland, Switzerland, and other parts of Europe.

## 6.—EQUISETUM PALUSTRE.

MARSH HORSE-TAIL.

(Plate 5, fig. 12.)

CHA.—Stem erect, naked or branched, rough. Sheaths long, loose. Teeth few and long.

SYN.—*Equisetum palustre* of all English Botanists.—*Equisetum nodosum*, Schr.—*Equisetum ramosum*, Schl.

FIG.—*E. B.* 2021.—*Bolt.* 35.—*Flo. Dan.* 1183.—*Lob. Icon.* 795.—*Ger. Her.* 1114.—*Schk.* 168, 169.

DES.—Root creeping. Stem upright, branched throughout, 6 to 12 inches high, dark green, deeply channelled. Branches 5 sided, simple, ascending, 6 to 10 in a whorl, a less number and shorter branches upwards. Catkins terminal, cylindrical, tapering, on a long stalk, erect, found in May and June, sometimes before the branches, at other times appearing long after the stem becomes branched. Sheaths large, loose, with a few long tapering black teeth.

$\beta$  (*alpinum*.) smaller, upper branches abortive.

$\gamma$  (*polystachion*.) upper branches elongated and fruitful.

The second variety is always found in such situations as convince us that its peculiar conformation arises from its being nipped by frost or cropped by cattle, especially as when thus proliferous, the main stem is almost always injured at the top; a proof that here, as often is the case with Flowering Plants, the early flowers being by any cause destroyed, the plant makes an effort to repair the loss at a later season of the year by producing others.

SIT. & HAB.—Very common in ponds, wet valleys, water-courses, &c.  $\beta$ :—Breadalbane Mountain, Perthshire, at 3000 feet high, *Mr. H. C. Watson*.  $\gamma$ : No certain habitat of this can be given, because it is an accidental state of the plant, and not a permanent variety. I have often found it in Richmond Park, Surrey, and by the side of the Lea River at Stratford, Essex.

GEO.—Common throughout Europe, and in North America.

## 7.—EQUISETUM VARIEGATUM.

VARIEGATED ROUGH HORSE-TAIL.

(Plate 5, fig. 14.)

CHA.—Stems procumbent, rough. Sheaths black at top. Teeth few, white, and persistent.

SYN.—*Equisetum variegatum*, Willd., Schl., Smith, Hook., Mack.—*Equisetum arenarium*, of Authors.—*Equisetum tenue*, Hopp.

FIG.—*E. B.* 1987.

DES.—Root very woolly. Stem branched at the base only, rather procumbent in habit, 4 to 6 inches long, of a green color, rough and channelled. Catkins terminal, ovate, at first black and sessile,

afterwards long-stalked, yellow and brown. Sheaths of the stem widening at top, black only at their upper part, which is sharply but not numerously toothed, the upper sheath of the stem being much larger and more spreading than the rest.

Its smaller size, recumbent habit, differently-colored sheaths, with their prominent and permanent teeth serve to distinguish this from *E. Hyemale*.

SIT.—On the sandy sea-shore in the north of the kingdom.

HAB.—ENG.: Sand hills on the Cheshire coast, between Hoylelake and the Rock Fort, *Mr. H. C. Watson*. Wardrew, Northumberland (abundant) *Mr. Winch*. Southport, Lane., *Mr. W. Wilson*. Near the Powder Magazine, in Wallasey, opposite Liverpool, *Mr. J. E. Bowman*. Bootle Sands, near Liverpool, *Mr. Rylands*.—SCO.: Sands of Barry, Forfarshire, *Dr. Greville*. Higher parts of the Tees, *Mr. Hogg*. Near Winch Bridge, Teesdale, *Mr. Bowman*. Near Avoeh, Rosshire, *Rev. G. Gordon*.—IRE.: Portmarnock, opposite Baldoyle, *Dr. Taylor*. Mueruss, Killarney (a tall var.), *Mr. W. Wilson*. Moist banks near a waterfall at the upper end of Colin Glen, Belfast, *Mr. Mackay*. Ballyharrigan Glen, near Dingiven, *Mr. D. Moore*.

GEO.—Switzerland, Italy, France, Alsatia, &c.

## 8.—EQUISETUM HYEMALE.

ROUGH HORSE-TAIL. SHAVE GRASS. DUTCH RUSH.

(Plate 5, fig. 13.)

CHA.—Stem erect, rough, deeply striated. Sheaths short, appressed, black at each end. Teeth deciduous.

SYN.—*Equisetum Hyemale*, *Linn.*, *Willd.*, *Smith*, *Hook.*, *Lightf.*, *Ehrh.*, *Huds.*, *With.*, *Pursh*, *Mack.*, *Gray*. (Not of *Bory.*)—*Equisetum nudum*, *Ray*, *Gerard*.

FIG.—*E. B.* 915.—*Hook.* in *Flo. Lon.* 161.—*Ger. Her.* 1113.—*Bolt.* 39.—*Schk. fil.* 172.

DES.—Root black, branched. Stems erect, of a very dark green, without whorls of branches, but forked and divided at the base, 2 to 3 feet high, regularly and numerously furrowed. Sheaths 2 to 3 inches distant from each other, very closely pressed to the stem, short, with a black rim at the top and bottom of each. Teeth of the scales black and deciduous.

It is surprising that this plant, so valuable in a general as well as a commercial point of view, is not cultivated along our sandy coasts, where it would grow luxuriantly and rapidly, forming a strong embankment, and yielding a considerable profit. The Dutch are well acquainted with the value of its long and matted roots in restraining the wasting effects of the ocean, which would soon undermine their dykes were it not for the *Equisetum Hyemale* which is planted upon them. At the proper season it is cut down and exported to other countries, where its naked and flinty stems are used for polishing domestic utensils, furniture, marble, &c. It is here sold as Dutch rush, (not Dutch rushes, which are a small variety of *Scirpus palustris*.)

So abundant is the silex upon both the inner and outer cuticle of the stem,

that it is said the whole of its vegetable matter may be removed without destroying the shape of the plant. Every part of it is a very beautiful object under the microscope.

SIT.—In woods and boggy places; rather rare, particularly in the South.

HAB.—ENG.: Hawthorn Dean, Durham, *Mr. T. H. Cooper*. Scotswood Dean, near Newcastle, *Mr. Bowman*. Near Over, Cheshire, *Mr. W. Wilson*. Common near Halifax, *Mr. R. Leyland*. South Kent, *Rev. G. E. Smith*. In a dell at Bitterley, below the Clce Hills, Salop. Forge valley, near Scarboro', Yorkshire; In a small stream at the bottom of Grace Dieu Wood, Charnwood Forest, Leicestershire, *Rev. A. Bloxam*.—WAL.: Near Wrexham, *Mr. J. E. Bowman*.—SCO.: Edinburgh, in the stream just below Roslyn Castle, *Mr. H. C. Watson*. On the Tees, *Mr. J. Hogg*. Moray and Rosshire, *Rev. G. Gordon*. Wood at Covra Linn, Lanarks, *Mr. C. C. Babington*.—IRE.: Tyrone, *Mr. Shuttleworth*. Wood at Leilip Castle, near Dublin. Powerscourt, and around Dublin, *Mr. Mackay*.

GEO.—All Germany, Holland, and Switzerland. From Canada to Virginia, and in Asia.

FINIS.







## EXPLANATION OF THE PLATES.

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**PLATE OF GENERA.**—Fig. 1, *Polypodium* (vulgare); 2, *Grammitis*; 3, *Aspidium* (filix-mas); 4, *Cistopteris* (fragilis); 5, *Woodsia* (ilvensis); 6, *Asplenium* (trichomanes); 7, *Scolopendrium*; 8, *Blechnum*; 9, *Pteris*; 10, *Cryptogramma*; 11, *Adiantum*; 12, *Trichomanes*; 13, *Hymenophyllum* (tunbridgense); 14, *Osmunda*; 15, *Botrychium*; 16, *Ophioglossum*; 17, *Pilularia*; 18, *Isoetes*; 19, *Lycopodium* (selaginoides); 20, *Equisetum* (fluviatile).—*Note.* This Plate shews in many instances the general structure of the Ferns, as in *Polypodium* are seen the spiral vessels of the stem and the sheaths of the root; in *Grammitis*, *Osmunda*, *Ophioglossum*, and *Lycopodium*, the stomata upon the cuticle; in *Aspidium* a scale is seen magnified; and in most of them a view of the theca, indusium, spores, elastic ring, and a cross section of the rachis, as alluded to in the introductory chapters.

**PLATE I.**—Fig. 1, *Grammitis eeterach*; 2, *Polypodium vulgare*; 3  $\alpha$ , *P. vulg.*, var. *proliferum*;  $\beta$ , *P. vulg.*, var. *cambricum*; 4, *P. phegopteris*; 5, *P. dryopteris*; 6, *P. calcareum*; 7, *Woodsia ilvensis*; 8, *W. hyperborea*; 9, *Cistopteris dentata*; 10, *C. dent.*, var. *angustata*; 11, *C. fragilis*; 12, *C. alpina*.

**PLATE II.**—Fig. 1, *Aspidium lonchitis*; 2, *A. lobatum*; 3, *A. aculeatum*; 4, *A. acul.*, var. *lonchitoides*; 5  $\alpha$ , *acul.*, var. *angulare*;  $\beta$ , *acul.*, var. *linearis*; 6, *A. thelypteris*; 7, *A. oreopteris*; 8, *A. filix-mas*; 9, *A. cristatum*; 10, *A. rigidum*; 11, *A. spinulosum*; 12, *A. dilatatum*.

**PLATE III.**—Fig. 1, *Asplenium septentrionale*; 2, *A. alternifolium*; 3, *A. marinum*; 4, *A. trichomanes*; 5, *A. viride*; 6, *A. ruta-muraria*; 7, *A. fontanum*; 8, *A. adiantum nigrum*; 9, *A. lanceolatum*; 10, *A. filix-femina*; 11, *Scolopendrium vulgare*; 12, *Pteris aquilina*.

**PLATE IV.**—Fig. 1, *Cryptogramma crispa*; 2, *Blechnum boreale*; 3, *Adiantum capillus-veneris*; 4, *Hymenophyllum tunbridgense*; 5, *H. wilsoni*; 6, *Trichomanes brevisetum*; 7, *Osmunda regalis* (young plants below); 8, *Botrychium lunaria*; 9, *Ophioglossum vulgatum*; 10, *Pilularia globulifera*; 11, *Isoetes lacustris*.

**PLATE V.**—Fig. 1, *Lycopodium clavatum*; 2, *L. annotinum*; 3, *L. inundatum*; 4, *L. selaginoides*; 5, *L. alpinum*; 6, *L. selago*; 7, *Equisetum fluviatile*; 8, *E. Drummondii*; 9, *E. arvense*; 10, *E. sylvaticum*; 11, *E. limosum*; 12, *E. palustre*; 13, *E. hyemale*; 14, *E. variegatum*.

**PLATE VI.** (varieties.)—Fig. 1, var. of *Polypodium vulgare*;  $\alpha$ , the common plant;  $\beta$ , *serratum*;  $\gamma$ , *proliferum*;  $\delta$ , *cambricum*;  $\epsilon$ , *acutum*.—Fig. 2, var. of *Scolopendrium vulgare*;  $\alpha$ ,  $\beta$ , *multifidum*;  $\gamma$ , part of a frond dilated at the base;  $\delta$ , *crispum*.—Fig. 3, var. of *Cistopteris dentata*;  $\alpha$ , pinnule of a barren frond;  $\beta$ , the usual wild state;  $\gamma$ , part of a cultivated frond;  $\delta$ , *angustata*.—Fig. 4, full-size frond of *Cistopteris alpina*, gathered at Layton, 1835 (see note page 24);  $\alpha$ , a barren pinnule (cultivated);  $\beta$ , pinnule from a Swiss specimen;  $\gamma$ , pinnule of a curious var. of one of the *Cistopterides*, perhaps of *dentata*; (I believe that this belonged to the late Mr. J. Dickson; I have the frond, which is marked *Pol. trifidum*, With. (true.) Can this be the Welch plant referred to by the latter author?)—Fig. 5, var. of *Cistopteris fragilis*;  $\alpha$ , barren frond;  $\beta$ , the usual state;  $\gamma$ , the effect of drought;  $\delta$ , from a cultivated specimen.—Fig. 6, different states of *Aspid. aculeatum*.—Fig. 7,  $\alpha$ , variety of *Aspid. lobatum*;  $\beta$ , *Botrychium lunaria*, with the lower

## EXPLANATION OF THE PLATES.

leaflets changing to fruit;  $\gamma$ , ditto, with the leaflets cleft (*multifidum*).—Fig. 8, varieties of *Aspl. filix-femina*;  $\alpha$ ,  $\beta$ , common var.;  $\gamma$ , var. *irriguum* (from Mr. Merriek);  $\delta$ , ditto, (from Mr. Pamplin);  $\epsilon$ , ditto, (from Rev. W. Bree)—Fig. 9,  $\alpha$ , the Irish var. of *Aspl. adiantum nigrum*;  $\beta$ , pinnule of the plant found by Dr. Emerson, (see note, page 41.) In these two, the small outline fronds show the part of the plant represented below them.— $\gamma$ , *Woodsia ilvensis*, when luxuriant, sold by nurserymen as *W. hyperborea*;  $\delta$ , part of a pinnule of a plant sold under the name of *W. ilvensis*. It is white beneath, and exceedingly hairy;  $\eta$ , pinnule of a var. of *Aspl. marinum*, found by Mr. Bree in Cornwall;  $\theta$ , pinnule of a rigid and ragged-looking Fern, believed to grow wild near Sheffield, given on the authority of Lord Fitzwilliam's gardener, Mr. Cooper.

## ERRATA AND ADDENDA.

In the *Plato of Genera*, which took me much trouble to execute, are two or three errors. The indusium of *Asplenium* (No. 6) is on the wrong side of the sorus; the theca of *Osmunda* should open vertically, and not transversely as represented; its stalk, also, is too long. The capsules of *Trichomanes* and *Hymenophyllum* are not accurate, their ring being transverse.

Page 12, in the heading of the Order *Equisetaceæ*, for "*Lycopodium*," read "*Equisetum*."

Page 28.—The variety  $\beta$  (*lonchitidoides*) is considered as belonging rather to *Aspidium lobatum*, than to *aenleatum*, by Sir W. J. Hooker, Mr. W. Wilson, Rev. W. Bree, and others; and many specimens which I have lately seen incline me to doubt the truth of the note, page 28, and consequently the propriety of removing the plant from *lobatum*, where Hooker has placed it.

Page 33.—To habitats of *Aspid. cristat.* add, I have reason to believe that the true plant grows abundantly on one part of Wimbledon Common, Surrey. The exact spot supposed to contain it is the western side of one of the valleys near the windmill.

Page 35, among the varieties of *Asp. dilatatum*, and in the preceding paragraph, for "*reflexum*, Bree," read "*recurvum*, Bree." Mr. Bree thinks this quite distinct from every state of the plant with which it is here connected; but except in habit and having a thicker rachis, I can discover no difference.

Page 41, line 1, for "the last," read "*lanceolatum*;" it being intended to compare *Aspidium fontanum* with that species, and not with *Aspidium rutamuraria*, which immediately precedes it.

To the Index add, *WOODSIA*, 19; *W. ilvensis*, 20; *W. hyperborea*, 20.



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